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USSR Report

EARTH SCIENCES

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USSR REPORT

EARTH SCIENCES

CONTENTS

METEOROLOGICAL CENTER'S FORECASTS AID VENUS PROBE TRACKING

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 Mar 85 p 3

[Article by M. Dmitruk]

[Abstract] On the occasion of World Meteorology Day, the article reports on severe-storm warning services provided by the USSR Hydrometeorological Scientific Research Center (Gidromettsentr). Warnings of hurricane-force winds, heavy precipitation, sharp temperature changes and other severe weather are furnished by the center to many organizations.

O. Belinskiy, head of the center's Department of Forecasts of Severe Weather Phenomena, reported that weather maps are now prepared with the aid of computers that perform 1.5 million operations a second. The center's severe-storm forecasts are said to be about 90 percent accurate, on the average. Belinskiy mentioned that the center plans to acquire a computer with a much larger capacity soon. It will make it possible to heighten the accuracy and usefulness of information on severe weather phenomena.

Testimonials from users of the storm warning service are quoted in the article. A letter from A. Bogomolov, corresponding member of the USSR Academy of Sciences, praised forecasts which have helped his group in operating the 64-meter dish antenna of a radio telescope near Moscow. Accurate forecasts of strong winds over a period of eight months permitted trouble-free receptions by the antenna of singlas from automatic interplanetary stations which are orbiting Venus.

FTD/SNAP
CSO: 1865/278

1

DIAGNOSIS OF 'WEATHER STATES' IN WINTER OF 1980-1981

KURBATKIN, G. P., USSR Hydrometeorological Center

[Abstract] Using maps of winter weather states for December 1980 through
February 1981 for the Rocky Mountains and Gulf of Alaska, a diagnostic study
is presented of the complex nonlinear mechanisms by which bottom boundary
conditions influence changes in atmosphere circulation. The weather states
for December and for January are found to differ significantly. The diagnostic
estimates produced show that nonadiabatic processes changing global atmospheric
circulation are related to unsteady fluctuations in atmospheric dynamics and
are themselves unsteady. The task of modeling and predicting changes in such
quasisteady "weather states" is quite complex. Heat fluxes should be studied
both by mathematical modeling and by direct measurement. Figures 3;
references 4: 1 Russian, 3 Western.
[182-6508]

MAIN PROBLEMS IN CLIMATE MONITORING (DIAGNOSIS)

GRUZA, G. V., RUBINSHTEYN, K. G., BIRMAN, B. A. and RAZUVAYEV, V. N.,
USSR Hydrometeorological Center

[Abstract] Climatic monitoring refers to an independent area of climatology
studying the problems involved in changes of climtae in combination with all
other changes occurring in the environment. It involves monitoring of the
status of the climatic system, determination of the degree of its anomaly and
possible causes for the anomaly, as well as the scale of probable results.
Climatic monitoring requires the creation of a well-founded system with
modern hardware for observing the status of the environment, transmission,
analysis and storage of information. The object of monitoring must be
climatic fluctuations over time scales from one month to several decades.
The spatial scale varies from local to global. An organization of the monitor-
ing system for the USSR is suggested, and it is noted that a number of
scientific problems remain to be solved. Climatic monitoring is an inter-
national problem, and must involve a number of governmental departments in
the USSR. Figures 2; tables 3; references 8: 7 Russian, 1 Western.
[182-6508]

USE OF METHOD OF CANONICAL CORRELATIONS FOR ANALYSIS OF CLIMATIC SERIES

TATARSKAYA, M. S. and FORTUS, M. I., Atmospheric Physics Institute, USSR
Academy of Sciences

[Abstract] A study was made of the application of the canonical correlations
method to problems of statistical climate prediction. In addition to the
simple problem of predicting the value of a climatic series for a given
moment in the future, the method is also applicable to the task of funding
functions of future values which are predicted on the basis of past values
with minimal error. The method was first applied to meteorology in 1967
by L. S. Gandin, who studied the statistical relationship between mean
monthly water temperature in the North Atlantic and the mean monthly air
temperature over the European USSR in December. Subsequent studies have
demonstrated that application of the method for actual climatic series allows
determination of optimal predicted values. The accuracy of prediction of
values in some cases, such as in the prediction of mean annual temperature
values in the 30-80°N latitude zone, can be significantly greater than the
prediction of actual values in the series. Figures 2; tables 4;
references 14: 11 Russian, 3 Western.
[182-6508]

EMPIRICAL ANALYSIS OF DIRECT AND INVERSE RELATIONSHIPS BETWEEN MACROSCALE
CHARACTERISTICS OF ATMOSPHERIC PROCESSES IN NORTHERN HEMISPHERE AND THERMAL
STATE OF NORTH ATLANTIC

YUDIN, M. I., MIRVIS, V. M. and CHUVASHINA, I. Ye., Main Geophysical
Observatory

[Abstract] New empirical data are presented on direct and inverse relation-
ships in the ocean-atmosphere system. The data are summarized and it is
demonstrated that the hypothesis that there are a number sequences of
direct and inverse relationships and self-oscillating processes is confirmed
at a rather high significance level. The authors do not propose cause-and-
effect relationships at the present time. The initial data used in the study
consisted of monthly values of changes in heat content in the upper 100-
meter water layer in the North Atlantic between 1949 and 1982. The

relationship of cloud cover and the thermal state of the ocean was also analyzed. The statistical analysis reveals a number of cyclic processes in the ocean-atmosphere system, as well as chains of direct and inverse relationships. Cold-season North Atlantic heat content anomalies are significant for subsequent development of large-scale atmospheric processes, which in turn cause disturbances in the thermal state of the ocean. Figures 4; tables 1; references 15: 13 Russian, 2 Western.
[182-6508]

ATMOSPHERIC AEROSOL AND ITS EFFECTS ON CLIMATE

KONDRAT'YEV, K. Ya. and PROKOF'YEV, M. A., Limnology Institute, USSR Academy of Sciences; Main Geophysical Observatory

[Abstract] This literature review discusses the influence of atmospheric aerosol on climate. A number of field studies of the past 10 to 15 years have discussed the importance of the contribution of aerosol-radiation effects to the energy budget of the atmosphere. Many authors have reported that large-scale systematic dust episodes in the troposphere can be related to deserts and volcanic phenomena. Considerable attention has been given to formulation of models of the radiation and microphysical properties of aerosol. A distinction must be drawn between the climatic effects of tropospheric and stratospheric aerosols. As yet, the calculated climatic effect of aerosols have not been compared with actual observed effects. Major trends are noted for studies of the climatic effect of aerosols: development of a realistic aerosol model for climate sensitivity studies; comparison of existing radiation transfer models which take aerosol effects into account; inclusion of radiation transfer parameters in the atmosphere with the aerosol in climatic models; and determination of global aerosol types necessary for climatic modeling by means of model experiments. References 68: 15 Russian, 53 Western.
[182-6508]

CLIMATICALLY ACTIVE TRACE GASES IN ATMOSPHERE

KAROL', I. L., Main Geophysical Observatory

[Abstract] A discussion of the results of a number of Soviet and foreign studies conducted up to early 1984 is presented. Characteristics of trace gas cycles are refined, both those observed and those expected in the future. Methods of execution and results of model estimates of these changes of radiation fluxes and climate on a global scale are described. Estimates for changes in global trace gas content anticipated by the year 2000 are presented and the greenhouse effect is predicted on the basis of models of development of the world economy and extrapolation of current trends. The system of interactions among photochemical processes, radiation, temperature and heat transfer is modeled. Photochemical processes in the troposphere and stratosphere primarily increase the greenhouse effect with an increase in content of trace gases in the atmosphere. Methane, NO_x, ozone and chloro-fluorohydrocarbons are included in the analysis. Figures 6, tables 3; references 26: 7 Russian, 19 Western.
[182-6508]

ESTIMATE OF RADIATION-CLIMATIC EFFECTS OF NATURAL AND ANTHROPOGENIC AEROSOL

MANUYLOVA, N. I., PETUKHOV, V. K., TARASOVA, T. A. and FEYGEL'SON, Ye. M.,
Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] Major results from 5 previous studies involving investigation and parameterization of the radiation aerosol effect are presented briefly. The effects of scattering and absorption are analyzed separately. Radiation effects of aerosol lead to changes in the albedo and absorptive capacity of the climatic system, resulting in restructuring of its dynamic parameters. The change in mean global albedo of the system is estimated for aerosols of varying optical thickness and absorptive capacity. The absorptive capacity is the major climate-forming parameter of aerosol, along with the number and size of aerosol particles. The aerosol significantly influences the temperature status of the climatic system primarily through direct changes in system albedo, to a lesser extent by the restructuring of the system caused by the aerosol. Figures 3; tables 2; references 11: 8 Russian, 3 Western.
[182-6508]

INFLUENCE OF POWER ENGINEERING ON CLIMATE

LEGASOV, V. A., KUZ'MIN, I. I. and CHERNOPLEKOV, A. N., Nuclear Energy
Institute imeni I. V. Kurchatov

[Abstract] A study is made of the influence of power production on changes
in global climate in order to estimate the effect of this factor over the
long term both on possible limitations in the increase in power consumption
and on the structure and fuel power balance. The article is essentially a
review of the rather contradictory literature on the subject, with an em-
phasis on later works assisting interpretation of earlier studies. Based
on estimates obtained of the scale of the effect of powerplants on climate
and the possible nature of these effects, power engineering is determined
to be a significant climate-altering factor, requiring consideration of
climatic effects in determining power development strategies. The ecological
aspects of the problem of safe development of power engineering must include
determination of the effectiveness of appropriations for protection of the
earth from the danger from possible climatic change. The problem of defining
quantitative indices reflecting changes in climate with sufficient accuracy
is therefore a major one. Figures 5; references 48: 22 Russian, 26 Western.
[182-6508]

RECENT CHANGES IN CLIMATE AND WORLD WATER BALANCE

DOBROVOL'SKIY, S. G. and KLINGE, R. K., Water Problems Institute, USSR
Academy of Sciences

[Abstract] Over the course of some decades water exchange between the ocean
and the landmasses free of continental glaciation occurs by means of fluxes
of moisture whose deviations from the mean in individual years are not
dependent on one another and which are only slightly related to changes in the
global temperature regime. In the series of water balance components for the
continents there are no long-term trends. The fluctuations of the mean
annual moisture fluxes exfhanged between the oceans and continents are
apparently determined by a combination of local evaporation factors. This
conclusion is consistent with the Hasselmann stochastic theory of climate.
There is only a slight correlation between iceberg runoff and macroscale
changes in the temperature regime. A similar result is given from a study of
the correlation between iceberg runoff and precipitation series. Changes in

the annual increments of water volume in the ocean also have a stochastic character. Temporal changes in averaged ocean level do not contain a linear trend. The principal contribution to variability of the annual increments of water volumes in the oceans and water reserves on the land is, however, iceberg runoff, primarily from Antarctica. It seems clear that the changes in volume of continental glaciation and ocean level are less sensitive to changes in air temperature than to changes in the precipitation regime. Precipitation falling on the continental glaciers, especially in Antarctica, is the most probable mechanism of changes in ocean level in the near·future. Figures 1; tables 4; references 40: 23 Russian, 17 Western. [292-5303]

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OCEANOGRAPHY

COMPUTER MODEL OF SEA OF AZOV'S ECOSYSTEM

Moscow NEDELYA in Russian 1-7 Apr 85 p 4

[Article by V. Khokhlachev]

[Text] Everyone on Deribasovskaya Street says that it is somewhat like having all of the Sea of Azov's 300 cubic kilometers of water sent to Odessa. And that scientists of the Odessa branch of the Ukrainian Academy of Sciences' Institute of Economics are studying the sea here. Academician A. N. Alymov, head of a department of the institute, reported the following in regard to this news:

"The Sea of Azov itself remains intact and in its proper place. A copy of it that is greatly reduced in size is now located in Odessa; it is a simulation model of the Sea of Azov's ecosystem. It is put into operation by means of a program-complex that was developed for a BESM-6 computer. A data bank that was compiled and a specially developed system of software have made it possible to impart natural traits to the model and make it lifelike, with all of life's features.

"This compact electronic model of the sea is the result of joint work by scientists and specialists not only of Odessa but also of Rostov University, the Azov Scientific Research Institute of the Fishing Industry, and the Ukrainian Academy of Sciences' Marine Hydrophysics Institute. Ecologists are now capable of reproducing all of the main hydrophysical, chemical and biological processes which take place on the surface and at deep levels of the water, from the mouth of the Don River to the Kerch Strait. This is the first complete model of a body of water in world practice which makes it possible to conduct specific studies of the marine ecological environment, forecast its behavior in various situations, and control the complex of natural and technical features of a large mass of water."

NEW SHIP 'DMITRIY NALIVKIN' FOR MARINE GEOLOGY

Moscow VODNYY TRANSPORT in Russian 26 Mar 85 p 4

[Text] Leningrad--The name of the eminent Soviet geologist,
Academician D. V. Nalivkin, has been given to a new scientific research
vessel for marine geological survey work. The ship "Dmitriy Nalivkin",
which was built to Soviet specifications in Finland, has arrived in Leningrad.
Here specialists of the association "Sevmorgeologiya" (Northern Marine
Geology) will outfit it with the latest geophysical equipment intended for
study of the deep-level structure of the sea bottom.

FTD/SNAP
CSO: 1865/278

RESEARCH SHIP 'KOROLEV' RETURNS FROM STUDIES OF JAPAN CURRENT

Moscow VODNYY TRANSPORT in Russian 16 Feb 85 p 3

[Text] Vladivostok—The "Akademik Korolev", flagship of a scientific research fleet, has returned to Vladivostok after a three-month ocean cruise. This was the largest expedition in recent years to study problems of the interaction of the ocean and the atmosphere.

The scientists worked in the region of the warm Japan Current, which is one of the five most energy-active zones of the ocean and where complex processes of the formation of weather over land take place.

FTD/SNAP
CSO: 1865/278

PLANS FOR ATLANTIC CRUISE OF NEW RESEARCH SHIP 'STRAKHOV'

Moscow IZVESTIYA in Russian 9 Apr 85 p 6

[Article by A. Pral'nikov]

[Excerpt] Mooring and sea trials of the scientific research ship "Akademik Nikolay Strakhov" will begin shortly. After the flag is raised on this vessel, it will make a short trip to Kaliningrad, which will become its port of registry. It will not anchor there for long; the route of its maiden cruise has already been plotted. The "Akademik Nikolay Strakhov" will head for the equatorial region of the Atlantic's eastern sector, for the deepest point of this ocean--the Romanche Trench.

B. Zolotarev, senior science associate of the USSR Academy of Sciences' Geology Institute and scientific director of this cruise, told about its program:

"The scientific research ship 'Akademik Nikolay Starkhov' belongs to the first series of ships that are specially intended for geological and geophysical work. Its equipment is excellent, and it has a system that prevents rolling and pitching, which is particularly important when work is being done at great depths.

"The ship's equipment complex includes devices for work with instruments directly on the ocean floor; special apparatus connected to a shipboard computer allows hydrogeochemical studies to be conducted on a routine basis. A multibeam sonic depth-finding system makes it possible to compile detailed maps of floor relief."

"How long will the maiden cruise last, Boris Petrovich?"

"Seventy days, more than 20 of which we have planned as working days at stations. It must be said that this is the highest percentage of such working time for all of the research cruises that have been organized up until now. Several visits to ports are planned, particularly a visit to Praia, the capital of the Republic of Cape Verde, to which we are to deliver a motor vehicle for Soviet geologists who are doing prospecting there.

"The Romanche Trench, which is almost 8 kilometers long, and two scientific survey areas in the vicinity of the Cape Verde Islands will become our main areas of work. The ship's whole system of hoisting equipment and apparatus is to be tested at the deepest point of the Atlantic. And in the survey areas, geophysical parameters are to be compared with already known data that were obtained during the 49th cruise of the research drilling vessel 'Glomar challenger.'"

"What is the main purpose of the trial cruise?"

"It will be a test cruise; the performance of all of the ship's research equipment-complexes and of the navigation equipment-complex is to be tested. Representatives of Finalnd's 'Hollming' firm, which built the ship, will monitor the operation of all of its systems.

"As for the purposes of the cruise, they are, properly speaking, to compile maps of floor relief and to study the structure of the upper layers of the Earth's crust beneath the ocean, non-uniformities of the crust's structural zones, and alternations of volcanic rocks according to depth."

FTD/SNAP
CSO: 1865/303

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UDC: 551.464.34:551.465.7

MODELING OF SEASONAL EVOLUTION OF CARBON CYCLE IN OCEAN-ATMOSPHERE SYSTEM

KAGAN, B. A., RYABCHENKO, V. A. and SAFRAY, A. S., Oceanology Institute,
USSR Academy of Sciences

[Abstract] A combined model for the seasonal evolution of heat conditions and
the carbon cycle in the ocean-atmosphere system is proposed. The basis of
the combined model is a thermodynamic model of the seasonal evolution of the
ocean-atmosphere system suggested in a previous study. The atmosphere and
ocean in the northern hemisphere are represented as a system of five inter-
connected boxes - two atmospheric and three oceanic. The two oceanic boxes
are the upper quasihomogeneous layer and the deep layer of the ocean in
the temperate and lower latitudes, within which the influx of heat from the
atmosphere is balanced by vertical advection (upwelling) of cold deep waters.
Comparison of calculated and experimental results shows that the major factors
determining the mean values and seasonal variability of characteristics of
the carbon cycle in the ocean-atmosphere system are the existence in the ocean
of cold deep water formations with sharp increases in rate of absorption of
atmospheric CO_2, fluctuation of sources and sinks of organic CO_2 and variation
of ocean water temperatures. External factors include the short-wave solar
radiation flux at the upper atmosphere boundary, absorption and emission
of short-wave and long-wave radiation, atmospheric and surface albedo, mean
annual production, consumption and half-life of organic matter, ocean depth,
wind speed, humidity and continental area. Figures 1; tables 2; references 22:
10 Russian, 12 Western.
[256-6508]

STUDY OF SIGNIFICANCE OF BOTTOM RELIEF IN BAROCLINIC MODEL OF EQUATORIAL COUNTERCURRENT

KUZ'MICHEVA, T. F., MIKHAYLOVA, E. N. and SHAPIRO, N. B., Marine Hydrophysics Institute, Ukrainian Academy of Sciences

[Abstract] A study of time variability and nonlinear interaction of barotropic and baroclinic components of current velocity was made, taking into account bottom relief in the process of formation of an equatorial countercurrent under the influence of an easterly wind and the heat flux through the ocean surface. The wind and heat flux excite circulation in the upper layer of the ocean. Processes in the baroclinic layer, acting though vertical movements at its lower boundary, cause movement in the deeper layers. During the initial stage, deep circulation does not match the bottom relief, the velocities of barotropic currents are high, particularly in shallow areas, and may significantly influence the current in the baroclinic layer. As time passes, deep currents and currents in the baroclinic layer adapt to the bottom relief, which is accompanied by a reduction in horizontal velocity gradients over submerged elevations. Figures 4; references: 5 Russian. [265-6508]

ANGULAR DISTRIBUTION OF INTENSITY OF SOUND RERADIATED BY OCEAN SURFACE AT SMALL GLANCING ANGLES

KOPYL, Ye. A., Acoustics Institute

[Abstract] A quantitative interpretation of field measurements made in a previous study of the angular structure of signals reradiated by the ocean surface with glancing incidence of acoustical waves is presented. Experimental and calculated values agree satisfactorily. Figures 2; references: 6 Russian. [265-6508]

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UDC: 551.466.8:551.461.5

INFLUENCE OF SHORT GRAVITY WAVES ON THERMAL RADIO EMISSION OF WATER SURFACE

IL'IN, V. A., NAUMOV, A. A., RAYZER, V. Yu., FILONOVICH, S. R. and
ETKIN, V. S., Moscow State Pedagogic Institute; Space Research Institute,
USSR Academy of Sciences

[Abstract] An experimental study is presented of the thermal radio emission
caused by short gravity waves, accompanied by a quantitative interpretation
of the data obtained. Emphasis is on an analysis of the variation in radio
brightness contrast as a function of steepness of the short gravity waves,
measured by means of a high-frequency radiometer operating in the $\lambda = 0.8$ cm
range. Waves were artificially generated in a small channel, wavelength 8-40 cm,
height 0.6-3 cm. Due to the high sensitivity of the radiometric apparatus
used, effects were recorded which were related to the influence of the profile
and steepness of the short gravity waves. The possibility of using the
geometrical optics approximation for quantitative interpretation of the ex-
perimental data is demonstrated. The model is based on essentially non-
Gaussian statistics of slopes corresponding to quasimonochromatic waves of
finite amplitude. Figures 6; references 17: 16 Russian, 1 Western.
[256-6508]

UDC: 552.51/52:551.8

UPPER MESOZOIC TURBIDITES OF SOUTHERN WEST SAKHALIN DOWNWARP

ZYABREV, S. V., Tectonics and Geology Institute, Far Eastern Scientific
Center, USSR Academy of Sciences, Khabarovsk

[Abstract] In the west Sakhalin downwarp the Albian deposits are very thick
terrigenous masses, nonuniform alternations of sandstones, siltstones and
argillites with some other rocks formed by erosion of the products of under-
water and continental volcanism. The textures and specifics of stratification
of deposits in the southern portion of the west Sakhalin downwarp were studied
in order to determine the origin of the sedimentary formations, conditions
of sedimentation and their evolution. The deposits are interpreted as
turbidites. Western sources of clastic material have been established. The
deposits were formed in deep-water alluvial fan systems at the base of a
deep water slope dropping down toward the east. Ancient currents confirm
the western sources of clastic material and indicate significant separation
from the eastern edge of the basin. Changes in facies in the section in a

lateral direction are not related to transgressions and regressions on the eastern side of the downwarp, but rather reflect the specifics of the sedimentaiton process. Traces of erosion and redeposition of argillite and sandstone fragments are not related to erosion of the eastern side of the downwarp but rather to the sedimentation process itself. Figures 5; references 14: 7 Russian, 7 Western.
[168-6508]

SPECTRUM OF TURBULENT FLUCTUATIONS IN SEA WATER DENSITY IN REGION OF LARGE WAVE NUMBERS

BRAMSON, M. A., FEDOROVSKIY, A. D., corresponding member, Ukrainian Academy of Sciences, NIKISHOV, V. I. and LUCHNIK, G. L., Hydromechanics Institute, Ukrainian Academy of Sciences, Kiev

[Abstract] The study of turbulent pulsations of velocity, temperature, salinity and density, and particularly of the behavior of spectral characteristics on the small scale, is an important subject in current studies of the ocean. This article analyzes the pulsation spectrum of the density of sea water in the region of large wave numbers. Turbulent in-homogeneities of the fields of temperature and salinity on a small scale are also analyzed. The spectral characteristics of pulsations of the density field and the boundary of the viscous-convective interval are determined by two parameters which can be measured by simultaneous recording of T and S pulsations by two sensors separated by a known distance. The averaging interval for the measurements can be rather small since the spatial scale corresponding to the viscous-convective interval is small. Processing of measurements can be alternated. References 4: 3 Russian, 1 Western.
[217-6508]

FLUCTUATIONS IN CONCENTRATION OF ARTIFICIAL RADIONUCLIDES IN BALTIC AND
NORTH SEAS IN 1977-1982

STYRO, D. B., KADZHENE, G. I., KLEYZA, I. V. and LUKINSKENE, M. V.

[Abstract] Regular observations of the radioactive contamination of the
Baltic and North Seas have been undertaken since 1973. The field data
obtained have allowed estimation of possible concentrations of radionuclides
and mathematical investigation of the structure of the fields of concentra-
tions of the nuclides for revealing possible sources of contamination. The
radionuclides are extracted from sea water by radiochemical methods plus a
rapid sorption method for ^{135}Cs. Variations in the concentration of radio-
nuclides in surface waters of the Baltic Sea have resulted from changes in
global fallout patterns resulting from atmospheric nuclear testing. Con-
tamination of the North Sea have resulted from changes in global fallout
patterns resulting from atmospheric nuclear testing. Contamination of the
North Sea has resulted from wastes discharged by nuclear industries. The
results of measurement of concentrations of radionuclides in the surface
waters of the Baltic and North Seas in the autumn of 1982 are described in
some detail. Maps of the fields of concentration of radionuclides are
presented. Figures 4; references 20: 12 Russian, 8 Western.
[219-6508]

INTERACTION OF SOUND WAVES WITH FINE THERMOHALINE STRUCTURES OF OCEAN

ARTEL'NYY, V. V. and RAYEVSKIY, M. A., Applied Physics Institute, USSR
Academy of Sciences

[Abstract] The interaction of acoustical waveguides with the fine thermo-
haline structure of the ocean is analyzed on the assumption of multiple
scattering. A study is made of a number of effects occurring in a broad
class of waveguides as a result of the presence of a fine structure, includ-
ing attenuation of the coherent component of the sound field, changes in its
angular spectrum, transformation of normal mode energy and losses resulting
from pumping of energy from nodes localized in the waveguide to modes
attenuating in the surrounding ground. The results obrained are extended
by means of a passage to the limit to the case of a channel with a sudden
change in the speed of sound. The main results of the study are extended to
the case of an underwater channel with a balanced profile. Figures 1;
references 5: 4 Russian, 1 Western.
[188-6508]

CORRELATION CHARACTERISTICS OF SIGNALS REFLECTED BY THE WAVY SURFACE OF OCEAN
IN MIRROR DIRECTION

ZHITKOVSKIY, Yu. Yu., NOSOV, A. V. and SAVEL'YEV, V. V., Oceanology
Institute imeni P. P. Shirshov, USSR Academy of Sciences

[Abstract] An experimental study was carried out to determine the correlation
characteristics of pseudonoise signals reflected from a wave-covered surface
in the mirror direction. The major measured quantity was the reciprocal
correlation coefficient between the transmitted signal and the reflected
signal. The transmitter was lowered from a ship on a 150 m cable. The
receiver and preamplifier were lowered to the same depth from a buoy which
was allowed to drift from the ship to a distance of 100-500 m, the changing
distance changing the angle of the beam reflected from the surface of the
ocean back down to the hydrophone. The radiator transmitted a pulsed
signal with a pseudonoise carrier. The results were interpreted within
the framework of ordinary correlation theory by processing several recordings,
calculating the sign and ordinary correlation coefficients to determine the
variation in sign correlation coefficient as a function of the ordinary correla-
tion coefficient. Graphs of the average variation are presented. It was
found that the medium did not distort the signal as it propagated through the
water mass (within the limits of experimental accuracy). The correlation
coefficient between the transmitted and reflected signals is thus determined
entirely by the characteristics of reradiation of the sound by the wave-
covered surface. .Figures 5; references 7: 6 Russian, 1 Western.
[188-6508]

NUMERICAL ESTIMATE OF EFFECTIVENESS OF APPROXIMATE EQUATIONS FOR ACOUSTIC
FIELD NEAR SURFACE OF DEEP SEA

PEREL', M. V., Leningrad State University imeni A. A. Zhdanov

[Abstract] The acoustic field in an oceanic waveguide is calculated.
The calculations for various velocity profiles confirm the effectiveness of
the approximate equations of V. S. Buslayev, who assisted in the preparation
of the article. Figures 5; references: 6 Russian.
[188-6508]

PETROCHEMICAL TYPES OF MAGMATIC ROCKS OF OCEAN FLOOR AND PATTERNS OF THEIR DISTRIBUTION

ABRAMOV, A. V., RYAKHOVSKIY, V. M. and MIRONOV, Yu. V., Moscow State University

[Abstract] In order to classify petrochemical data on oncean floor crustal rocks the authors used an algorithm for processing multivariate samples, a nonparametric classification method. The classification includes no a priori assumptions concerning the structure of the sample and introduces no predefined numerical criteria. The distances between points are applicable to samples with any multivariate distribution. The initial data used were compositions of magmatic oceanic rock from a previous publication. The processing allowed the following numbers of clusters to be distinguished in the sample in each of the four steps: 239, 90, 29, 7. The seven final clusters are described. It is concluded that the absence of unidirectional petrochemical evolution of oceanic basalts upon transition from one morphological structure to another and their sharp petrochemical specialization in this case indicate the relative nondependence of the paths of development of different morphostructural zones in the ocean floor. Figures 3; tables 1; references 17: 16 Russian, 1 Western.
[230-6508]

INTRUSIVE ROCKS OF OCEANIC LITHOSPHERE AS POSSIBLE SOURCES OF ANOMALOUS MAGNETIC FIELD OF OCEAN

NAZAROVA, Ye. A., Lithosphere Institute, USSR Academy of Sciences, Moscow

[Abstract] Results are presented from study of rock dredged from the ocean floor, plus data published in a previous review on the magnetic characteristics of 50 oceanic intrusive rocks brought up during several cruises of the "Glomar Challenger." The intrusive rocks represent a cross-section of the oceanic crust. The samples available are very few in number. Available data on ore mineralogy and magnetic characteristics are analyzed for the available specimens. Analysis of the magnetic characteristics of the rocks shows that neither fresh cumulative gabbro containing fine-grained magnetite nor amphibolitized and serpentinized gabbro containing magnetite grains from

pseudo-single-domain to multi-domain size can be considered regulator
sources of linear magnetic anomalies. Thin dolerite sills containing fine-
grained magnetite with hardened edges may be sources of local magnetic
anomalies. Peridotites representing the lower portion of layer 3B
and the upper mantle, upon serpentinization, as a result of the forma-
tion of secondary magnetite, take on intensive and stable chemical
magnetization. Only serpentinized cumulative peridotites have the necessary
magnetic characteristics to be sources of linear magnetic anomalies.
Figures 3; tables 3; references 16: 5 Russian, 11 Western.
[230-6508]

COMPOSITION AND AGE OF SILICEOUS ROCKS OF SHIRSHOV RIDGE (BERING SEA)

TSUKANOV, N. V., VISHNEVSKAYA, V. S., KAZARINA, G. Kh. and VITUKHIN, D. I.,
Geology Institute, USSR Academy of Sciences; Lithosphere Institute, USSR
Academy of Sciences; Oceanology Institute, USSR Academy of Sciences, Moscow

[Abstract] During the 29th cruise of the research vessel "Dmitriy
Mendeleyev" in the summer of 1982, geological prospecting work was conducted
on Shirshov Ridge in the Bering Sea. Determination of the tectonic position
of this structure is a key to the understanding of the geological evolution
of the Bering Sea region. A total of twelve dreding operations were con-
ducted on the ridge, bringing up abundant and varied rock material with a
total weight of about 400 kg. The siliceous and siliceous-clayey rock in-
cluded paleontological remains. Radiolarian skeletons were obtained from
the lithified rock by hydrofluoric acid etching. Radiolaria and diatoms were
obtained from the formations by breakdown with hydrogen peroxide. A study
of these remains allowed late Miocene-Paleogene and Late Cretaceous-early
Paleogene complexes to be distinguished, as well as a rare Triassic complex.
The rock is described in its stratigraphic sequence from bottom to top.
Figures 1; references 16: 6 Russian, 10 Western.
[169-6508]

MAGMATIC PROVINCES AND TECTONICS IN PACIFIC OCEAN

PUSHCHAROVSKIY, Yu. M., Geology Institute, USSR Academy of Sciences, Moscow

[Abstract] In recent years several expeditions have been conducted in the
central and northern Pacific Ocean, yielding good collections of oceanic
crustal rock. Processing of materials collected during the 21st, 23rd and
28th cruises of the research vessel "Dmitriy Mendeleyev" has revealed signi-
ficant differences in the chemism of basalts of the abyssal plates, large
upthrusts with thickened crust and linear volcanic ridges. The abyssal
plates have been tested in a number of areas. A determination of
correlations between the large structural formations and basalt magmatism
of the Pacific Ocean floor is very important for an approach to the geo-
logical history problems of this area. There have been at least two major
tectonic-magmatic stages in the central and northwestern Pacific. Each
major stage reflects a unique combination of geological conditions. The
possibility of distinguishing and differentiating magmatic provinces allows
basaltic series differing in their petrochemical features and content of
individual metals to be distinguished. Analysis of the composition of
mantle tectonites has shown regional differences in the composition of the
upper mantle existing before the partial melting with which the formation
of specific complexes is associated. The correlation which has been ob-
served between magmatism and major tectonic elements and regions in the
Pacific indicates the complex picture of geological development of the
lithosphere in this area, which cannot be reduced to simplified systems of
movement of a homogeneous lithospheric monolith. Implementation of the
Soviet research project "Litos" will provide important new data on the
geology of the oceans. However, additional specialized marine expeditions
in different oceans are required to supplement the available factual
information. References 11: 5 Russian, 6 Western.
[169-6508]

GEOCHEMISTRY AND ENERGETICS OF CYCLING OF MATTER IN FORMATION OF CRUST IN
ACTIVE STRUCTURES OF OCEAN

IL'IN, V. A. and SHCHERBAKOV, A. V., Geology Institute, USSR Academy of
Sciences, Moscow

[Abstract] A geochemical model was developed to check the quantitative
relationships between the sedimentary and volcanogenic matter during the
course of the cycling of matter related to the formation of the crust in
active ocean structures. The model shows that the subduction zone should
receive iron and magnesium ions from the mantle. Remaining elements are
carried into the crust, the accumulation of silica and alumina in the crust
supporting constant oxidation. The problem of the high content of Ca in
sedimentary rock and the shift of the Na/K ratio in the direction of K are
explained. The model thus explains the observed chemical differentiation
between continental and oceanic crusts, as well as the mechanism of their
development and evolution. Processes of transformation of an oceanic crust
to a continental crust in subduction zones are calculated to require $7.5 \cdot 10^{18}$
calories of heat per year. The hydrothermal process on the continents and
ocean floor consumes $8.0 \cdot 10^{18}$ cal/yr, $6.4 \cdot 10^{18}$ cal/yr being carried away by
hydrotherms and $1.6 \cdot 10^{18}$ cal/yr being absorbed by deep hydrothermal systems.
This means that the major effect of hydrothermal activity is restricted to
the midocean ridges, only one-fifth being associated with volcanic regions.
A diagram of the interrelated crust and asthenosphere is presented. Figures 2;
tables 1; references: 6 Russian,
[222-6508]

STRUCTURE OF TADJOURA RIFT IN GULF OF ADEN BASED ON DATA FROM MANNED
SUBMERSIBLES

LISITSYN, A. P., corresponding member, USSR Academy of Sciences,
BOGDANOV, Yu. A., ZONENSHAYN, L. P., KUZ'MIN, M. I. and SAGALEVICH, A. M.,
Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] A section of Tadjoura rift near 45°E was selected where the rift
makes the transition to the structures of Sheba Ridge. An area of 2,310 km^2
was studied in detail and mapped at 1:50,000. The geological situation in
this area was evaluated by studying more than 100 samples taken by corers
and bottom dredges. The detailed studies allowed areas to be selected for
thirty-two missions by the "Paysis" submersibles. In one month the submersibles

spent twelve days under water, traversing 90 km along the bottom, bringing
up 155 geological specimens and taking more than 500 color photographs.
Sample photographs are presented (in monochrome). Orientation of structural
elements in the rift changes significantly from the edges to the center, with
thrust steps on the edges having a sublatitudinal strike, whereas the
internal rift is oriented in a new direction 295-300 degrees. Neither of
these directions is orthogonal to the direction of spreading. Intensive
hydrothermal activity was observed in the rift. Figures 2; references 5:
1 Russian, 4 Western.
[222-6508]

UDC: 551.464.1:550.4

NEW DATA ON BEHAVIOR PATTERN OF COPPER IN INDIAN OCEAN WATERS

KURIL'CHIKOVA, G. Ye., Oceanology Institute imeni P. P. Shirshov, USSR
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[Abstract] A new method is suggested for interpreting the results of experi-
ments by comparing data on the concentrations of labile complexes of metals
in freshly sampled sea water after ultrafiltration with the same data after
equilibrium is established in the system and processes of spontaneous change
in the matter stop, requiring 1 to 1.5 year. The concentrations must
be compared with the total concentrations of the metal, showing the signi-
ficance of inert metal complexes. Experimental studies of sea water have
established that the fraction of the labile concentration of complexes in
freshly collected water, continuously changing over time until equilibrium
is achieved, is a characteristic of the composition of the natural solution
and is quite sensitive to its changes. The experimental data on the behavior
of copper as an indicator element show that middle-depth ocean water differs
significantly from both abyssal and surface water in its physical and chemical
properties. The method suggested can be used for comprehensive and detailed
study of biogenic sedimentation and the zonality of ocean waters, and also
to reveal certain geochemical characteristics of ocean water above metal-
bearing sediments. Figures 4; references: 8 Russian.
[222-6508]

CONTRIBUTION OF DIFFUSION PROCESSES TO THE ELECTRIC FIELD OF THE OCEAN

TISHCHENKO, P. Ya., Pacific Ocean Oceanological Institute, Far Eastern
Scientific Center, USSR Academy of Sciences, Vladivostok

[Abstract] A study is made of that portion of the electric field in the ocean
which results from diffusion of ions in sea water due to the presence of con-
centration, gravitational and temperature fields. Methods of linear non-
equilibrium thermodynamics are used in the study. An electric profile is
computed to establish the magnitude and nature of the electric field in the
ocean caused by the processes in question, corresponding to an arbitrary
hydrophysical profile. All three contributions to the total electric field
considered in this article are of the same order of magnitude. The maximum
electric field gradients are found in the upper levels of the ocean where
the changes in parameters t and S are greatest. Figures 1; tables 1;
references 11: 2 Russian, 9 Western.
[222-6508]

OIL AND GAS DEPOSITS ON CONTINENTAL SLOPES OF THE OCEAN

GEODEKYAN, A. A., corresponding member, USSR Academy of Sciences,
ZABANBARK, A. and KONYUKHOV, A. I., Oceanology Institute
imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] It has been suggested that some 95% of the hydrocarbon deposits
in the ocean will probably be found in shelf zones and on the continental
slopes at depths of not over 3,000 m and 65% not over 300 m. Some twenty-six
deposits of oil, gas and gas condensate have been found to date on the
continental slopes of the ocean. Almost all hydrocarbon deposits are located
on the slopes of the passive continental margins of the Atlantic and Indian
Oceans. The collectors for oil and gas deposits are almost exclusively sand-
stones. Analysis of known deposits shows that ancient delta complexes on the
continental margins contain oil and gas not only because they are characterized
by good collectors, but also primarily due to the optimal relationship of
natural reservoirs, continental rock and cover horizons. There are two
stages in the formation of regional oil- and gas-bearing terrigenous masses,
genetically related to rivers: periods of rift formation and burial of
continental margins, and periods of cretaceous or early Cenozoic tectonic
activation within the limits of a margin already formed, during which sinking
occurred in the areas where ancient transverse rifts met the ocean. The oil
and gas content of the continental margins is not only determined by rift-
forming zones and paleodeltas, but also is related to perioceanic basins,

superimposed depressions and other structures within which various complexes
of deposits such as reefs, shallow water marine and lagoon formations
(and on active margins, turbidites) are developed. Tables 1;
references 6: 2 Russian, 4 Western.
[232-6508]

ACOUSTICAL FIELD OF DIRECTIONAL SOURCE IN OCEANIC WAVEGUIDES

BYKOVTSEV, G. I., KUZNETSOV, G. N. and STEPANOV, A. N., Kuybyshev State
University

[Abstract] A model is suggested for an equivalent point source having
arbitrary directionality to replace actual sound sources radiating in an
oceanic waveguide. The model allows calculation of the hydroacoustical fields
of directional sources in a medium limited by division boundary surfaces for
sufficiently low radiating frequencies. Expressions are obtained for the
potential of an equivalent point source in waveguides of various types. By
minimizing the maximum likelihood functional it is possible to use measured
pressure values to estimate the multipole moments determining the directionality
of radiation. The parameter estimation procedure using this method is better
than when a Taylor expansion model is used. References: 3 Russian.
[229-6508]

PETROLOGIC ASPECT OF FORMATION OF GEOSTRUCTURES IN MARGINAL SEAS

PERCHUK, L. L., Institute of Experimental Mineralogy, USSR Academy of
Sciences, Chernogolovka, Moscow Oblast

[Abstract] A study is made of the petrology of formation of geological
structures in the marginal seas, since data are not available relating geo-
dynamics and magmatism of intracontinental depressions. It is demonstrated
in the example of the Sea of Japan that the formation of depressions is
preceded by orogeny with superimposed acid and neutral magmatism and sub-
sequent intensive denudation of volcanic structures. A change in the
direction of vertical motion corresponds to predominance of andesites and
basalts in volcanism, accumulation of thick masses of tuffs in narrow geo-
synclinal depressions, followed by intensive underwater flows of andesite-
basalts and basalts. The hypothesis suggesting formation of depressions by

the mechanism of magmatic substitution must be further experimentally and theoretically developed and confirmed. Figures 2; references 15: 13 Russian, 2 Western.
[229-6508]

SPREADING IN DEVELOPMENT OF OCEANIC STRUCTURES

PUSHCHAROVSKIY, Yu. M. and RUZHENTSEV, S. V., Geology Institute, USSR Academy of Sciences, Moscow

[Abstract] This article was stimulated by the question as to whether the width of a rift valley, rate of spreading and time of formation of basalts have always been the same as now. Data on the time of formation of tholeiitic basalts of different ages in the midocean ridges are incomplete. Based on studies of the East Pacific Rise and the western limb of the Mid-Atlantic Ridge, an attempt is made to explain differences in the structure of the first and second layers of the ocean on the one hand and volcanic-sedimentary series of various stages of development of eugeosynclinal zones in the Paleozoic folded belts on the other. Among the widely varied structures of the oceanic crust, the contemporary oceans represent a type characterized by the presence of a single world system of narrow volcanically active ocean spreading centers. Reconstructed paleoocean structures arose in a more complex geodynamic situation than the oceans. They are characterized by distributed spreading, which appeared in the contemporary oceans in the early stages of their development. The essence of evolution of the Phanerozoic structures with the oceanic type crust has been one of changes from smaller but more complex structures and combinations to larger and simpler structures. The mesooceans can be considered transitional structures. Figures 1; references 15: 2 Russian, 13 Western.
[225-6508]

INFLUENCE OF WATER VAPOR ON DISTRIBUTION OF TURBULENT WAKE PARAMETERS

PILYUGIN, N. N. and TIKHOMIROV, S. G.

[Abstract] An experimental study was made of phenomena transpiring in an air flow near models flying on an aeroballistic path at hypersonic velocities. The objective was a determination of the influence of water vapor on measurements of gas parameters such as electron concentration or radiation intensity.

(The authors have formulated the problem and given the necessary mathematical transforms in studies published earlier.) Particular attention is given to an article by R. L. Schapker, et al., entitled "NO_2 Chemiluminescent Wake Radiation," in AIAA PAP., No 68-702, 1968. It is noted that Schapker, et al. made a theoretical study of the influence of chemical reactions with the participation of water vapor in the air only on chemiluminescent radiation in a wake; no attention was given to the influence of water vapor on the electron concentration. This article gives the results of computations of the distributions of nonequilibrium parameters in a wake with allowance for chemical reactions in the air and water vapor under conditions characteristic for aeroballistic experiments. Specifically, the authors give a solution of equations for an axisymmetric turbulent boundary layer describing a current of a nonequilibrium multicomponent gas in the distant wake behind such a body moving at hypersonic velocity. On this basis a model of chemical kinetics is presented which takes 22 components into account. A total of 91 reactions is possible. A list of reactions between dry air components is given, as well as reactions with the participation of components containing hydrogen. It is shown that use of the proposed chemical kinetics model and computation method make it possible to compute parameters of a distant wake more precisely than by the Schapker method. It is clearly demonstrated that in the interpretation of the results of ballistic measurements for measuring the intensity of chemiluminescent radiation and electron concentration in a distant air wake it is necessary that the influence of water vapor be taken into account when $\xi_{H_2O} > 10^{-4}$. Figures 4; tables 1; references 22: 16 Russian, 6 Western.

[305-5303]

DIFFRACTION OF INTERNAL WAVES DESCRIBED BY EQUATION OF SLIGHTLY STRATIFIED FLUID ON HALF-PLANE

ISMAIL-ZADE, A. T.

[Abstract] The diffraction of plane waves in a slightly exponentially stratified fluid on a plane barrier placed in this fluid was investigated. The problem is pertinent with respect to the study of internal waves in the ocean. The considered problem is regarded as highly unusual from the mathematical point of view because it is formulated as a boundary value problem for a hyperbolic equation with boundary conditions characteristic for elliptical equations. It was demonstrated long ago that such a formulation is incorrect if only a limited region is examined but the problem is well formulated and has physical sense in the case of unlimited regions when there are appropriate conditions in the neighborhood of an infinitely distant point. The formulation and results are compared with a series of studies along these lines by S. A. Gabov, et al. (DOKLADY AKADEMII NAUK SSSR, Vol 264, No 1, 1982; Vol 265,

No 1, 1982; Vol 268, No 5, 1983; ZHURN. VYCH. MATEM. I MATEM. FIZIKI,
Vol 22, No 6, 1982). It is shown that the diffraction pattern obtained with
$\beta^2 \to 0$ outside a restricted region differs qualitatively from the diffraction
pattern examined by Gamov. Specifically, the neglecting of the term $\beta^2 U$ in
the Klein-Gordon equation, employed by Gamov, gives erroneous results.
References: 6 Russian.
[265-5303]

DISTRIBUTION OF PRINCIPAL TYPES OF RECENT BOTTOM DEPOSITS ON NORTHWESTERN
SHELF OF GUINEA

YEMEL'YANOV, V. A., Geological Sciences Institute, Ukrainian Academy of
Sciences, Kiev

[Abstract] The results of studies of bottom deposits in the coastal zone of
the Guinea shelf are presented on the basis of 60 samples of recent deposits
from depths of 4-15 m (Fig. 1 is a map of $CaCO_3$ distribution in this area).
It was possible to discriminate the following principal granulometric types
of recent bottom deposits: sands, silty sands, sandy silts and silts. Among
the minerals quartz predominated in all the samples. In the sandy silts and
the silty sands a considerable role in forming the structure and mineralogical
composition is played by remnants of calcareous skeletons and shells of
benthos organisms. Since on the adjacent part of the continent there are
virtually no calcareous rocks, the $CaCO_3$ content in bottom deposits is in-
dicative of the role of biogenous factors in their formation. The role of
the biogenous factor increases with depth. Winds play a major role in the
receipt of sedimentary material. This is indicated by the presence of
fractions <0.05 mm, primarily quartz grains with typical aeolian working.
Abrasion of shores and the bottom also plays an important role in the
formation of sediments. The collected data were used in compiling a map of
bottom deposits in the coastal zone of the shelf to depths of 15-20 m
(Fig. 2). The greatest part of the bottom is covered with terrigenous and
biogenous-terrigenous silty sands and sandy silts. The fine silty sediments
found in limited areas remote from the shore appear to be deposits of ancient
mangrove shores. Figures 2; references 5: 4 Russian, 1 Western.
[257-5303]

POSSIBILITY OF SOUNDING EARTH BY USING ELECTROMAGNETIC FIELD OF SEA CURRENT

SMAGIN, V. P., FONAREV, G. A. and SAVCHENKO, V. N., Far Eastern State University; Terrestrial Magnetism, Ionosphere and Radio Propagation Institute, USSR Academy of Sciences

[Abstract] The authors analyze the possibilities of determining the conductivity of bottom rocks by measuring different combinations of components of the electromagnetic field of a current on the ocean floor. It is shown that the sea current induces an electromagnetic field in the geomagnetic field. Then a formula is derived for the magnetic component B. After determining B it is possible to find the electric field in sea water and in rocks beneath the ocean layer. The parameter ε is introduced which makes it possible to ascertain the vertical gradient of the magnetic field in bottom rocks; a function is derived which characterizes the magnetic field in the bottom rocks. Formulas are derived which can be used in estimating the width of a current by an electromagnetic method. It is shown, therefore, that with electromagnetic sounding in the fields of sea currents it is possible to make a simple interpretation of the experimental data within the framework of an exponential model of ocean floor conductivity. [This article essentially represents a continuation of an earlier study by the authors in GEOMAGNETIZM I AERONOMIYA, Vol 22, No 4, pp 623-628, 1982 entitled "Possibility of Studying Sea Geoelectric Sections From the Electromagnetic Fields of Currents."] References: 3 Russian.
[290-5303]

ELECTROMAGNETIC FIELD OF THREE-DIMENSIONAL SURFACE SEA WAVES

SOCHEL'NIKOV, V. V., Southern Branch, Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences

[Abstract] Numerous attempts have been made to obtain estimates of the electromagnetic field of three-dimensional sea waves. Use has been made of hypothetical models with an eddy distribution of velocity through the entire fluid layer. Since these efforts have been largely unsuccessful, an effort was made to obtain a rigorous solution for the electromagnetic field of three-dimensional sea waves of wind origin. The same assumptions are made as for a model of a two-dimensional wave formulated earlier by the author (OSNOVY TEORII YESTESTVENNOGO ELEKTROMAGNITNOGO POLYA V MORE, Leningrad, Gidrometeoizdat, 1979, 216 pages). First an expression is derived for the

velocity of fluid particles, making it possible to proceed to the derivation
of expressions for the induced electromagnetic field. It is shown that
the induced electric field is a potential field. Formulas are then found
that show that the induced electric field is not dependent on the conductivity
of the ambient medium; the current does not flow into the bottom and therefore
the magnetic field should not be dependent on bottom conductivity: the
induced electromagnetic field is completely determined by the vertical
component H_z (TJ-wave). All this is demonstrated and expressions are
derived for the components of strength for the induced magnetic field.
The induced magnetic field is dependent only on sea water conductivity.
Since the EM field induced by three-dimensional sea waves is not dependent
on bottom conductivity it cannot be used for its electromagnetic sounding.
The induced field (as in the case of two-dimensional sea waves) is noise in
electromagnetic research in the sea. References: 5 Russian.
[290-5303]

STRATIGRAPHY OF SEDIMENTS IN CENTRAL AND EASTERN MEDITERRANEAN

SOROKIN, V. M., AFANAS'YEVA, M. S., KURENKOVA, V. G. and CHERNYSHOVA, M. B.,
Geology Faculty, Moscow State University

[Abstract] In many parts of the Mediterranean there have been only limited
stratigraphic studies. The least attention has been given to the near-shore
portions of the Adriatic, Ionian and Levantian Basins where sedimentation
processes are typically most diverse and complex. A total of 57 cores of
sediments with a length up to 6 m were obtained during cruises of the
"Akademik Pokrovskiy" in 1973, 1979 and 1980. The cores were taken along
profiles intersecting the continental slope and adjacent abyssal depressions.
The sediments were broken down by a number of lithological and biostratigraphic
methods, including study of plankton and benthos foraminifera, pollen and
spores, sapropel and ash interlayers and textural varieties. Using a com-
bination of micropaleontological and lithological methods which mutually supple-
ment one another it was possible with a high degree of accuracy to discriminate
the following horizons in the Late Quaternary deposits of the Central and
Eastern Mediterranean: Riss, Riss-Würm, Würm and Holocene. The results
confirm the principles of stratification of Mediterranean sediments proposed
by Olausson, Ryan and others. As illustrated in several graphs, the corre-
lation of sections in the studied cores made it possible to plot the nature
of change in the thicknesses of sediments in horizons of the same age within
margins of the basin different in their tectonic position. Figures 3;
references 20: 4 Russian, 16 Western.
[277-5303]

RELIEF AND TECTONICS OF CONTINENTAL MARGIN OF GUINEA

GREKU, R. Kh., NASIROV, A. Ya., MISHCHUK, I. T., FEDOROV, V. N. and
GUR'YEVA, T. B., Marine Hydrophysics Institute, Ukrainian Academy of Sciences,
Sevastopol; Geology Institute, Azerbaijan Academy of Sciences, Baku

[Abstract] The continental margin off Guinea extends in a southwesterly
direction for 250-300 km and on three sides is bounded by the continental
slope. The margin has a level surface, tilted slightly from the continent
toward the ocean, constituting an accumulative-denudational and in part an
accumulative plain. Bottom relief was studied on the 28th cruise of the
"Akademik Vernadskiy." The collected data were used in plotting a bathymetric
chart (Fig. 1) and a geomorphological map of the shelf and continental slope
(Fig. 2). The shelf relief in general is smooth or slightly undulating and
there are no abrupt rises or depressions; however, it is dissected by a
series of submarine canyons. On the basis of the nature of relief and bottom
surface slope it was possible to define inner and outer zones on the shelf.
The first occupies most of the shelf, begins directly at the shoreline and
extends to a depth of 50-60 m; it is characterized by a very gentle bottom
slope of about 5'. The outer zone is considerably narrower than the inner
slope and the surface slope is 20-30'. The outer edge is characterized by a
large number of hills, scarps and terraces. Tectonic factors are probably
responsible for genesis of the continental margin. The terrace levels are
undoubtedly directly related to abrasional-accumulative processes. Eustatic
rises of ocean level possibly played a significant role. Tectonic movements
were the initiator of all these processes. They account for formation of
bottom relief, the distribution of sectors of denudation and accumulation and
the nature of sedimentation. The steplike subsidence of crustal blocks in
the region of the Guinea continental margin is associated with dilatational
forces and is consistent with the concepts of plate tectonics. Figures 3;
references 7: 5 Russian, 2 Western.
[302-5303]

PRESENCE OF PHOSPHORITE ON CONTINENTAL MARGIN OF EQUATORIAL AFRICA (BASED ON
DATA FROM GUINEA TEST RANGE)

SHNYUKOV, Ye. F., BELEVTSEV, R. Ya., MITROPOL'SKIY, A. Yu., SHCHERBAKOV, I. B.
and GRIGOR'YEV, A. V., Geological Sciences Institute, Ukrainian Academy of
Sciences, Kiev; Geochemistry and Mineral Physics Institute, Ukrainian Academy
of Sciences, Kiev

[Abstract] Investigations in the Guinea test range, situated between 9° and
10°45'N, were carried out by a Soviet-Guinean expedition from aboard the

"Akademik Vernadskiy." About 40 stations were occupied where bottom samples were taken by bottom instruments. Hydrochemical, hydrophysical, lithological and mineralogical studies of these samples were made. It was possible to detect both Holocene phosphorite formation and its lithological expression and ancient bedrock phosphorites, hypothetically of Paleogene age. Figure 1 is a lithological map of bottom deposits in the Guinea test range. Other diagrams and maps in the text show a schematic section of the accumulation of sediments on the continental slope and shelf and the granulometric composition of bottom sediments, the phosphorus distribution in the surface layer of sediments, the distribution of vanadium in the surface layer of bottom sediments and the distribution of phosphates in water and bottom sediments. An earlier unknown geochemical anomaly of increased contents of phosphorus in bottom sediments over a considerable part of the area of the outer shelf and continental slope was discovered. Within the limits of the area of phosphoritic sediments there is a broad (100 x 20 km) band of phosphorite-glauconitic sands and silts. The phosphorus is concentrated in rounded particles of phosphorites of sand and silt size. The predominant mineral is collophane and to a lesser degree francolite. The phosphorite-glauconitic sands and silts are a mineral expression of the modern process of phosphorite formation transpiring on the continental margin of Guinea. This is evidence of a constant phosphatization of recent organic remains, the enrichment of the waters over the zone of development of sediments containing phosphorite with phosphorus as a result of the upwelling of waters. Figures 7; tables 1; references 11: 6 Russian, 5 Western.
[302-5303]

STRUCTURE OF ACOUSTIC FIELD IN DEEP SEA AT SHALLOW DEPTHS AND AT GREAT RANGES

BUSLAYEV, V. S. and PEREL', M. V.

[Abstract] A study was made of the structure of the acoustic field in a deep sea at shallow depths and with great ranges. The problem is formulated as follows. The field is examined in the half-space $r = (x, y, z)$, $z \geqslant 0$. It is assumed that the water layer $0 \leqslant z < h$ is situated over a homogeneous underlying liquid half-space $h < z$ (bottom). The acoustic field $u = u(r)$ generated at the point by a harmonic source of the frequency f, situated at the point $r_0 = (x_0, y_0, z_0)$, is described by the equation $\Delta u + p^2 n^2 u = -\delta(r - r_0)$,

$n = c_*/c$, $p = 2\pi f/c_*$, where c_* is the minimum speed of sound c. It is also

assumed that the speed of sound and density are dependent only on depth z; the speed of sound in the bottom is greater than the speed of sound in the water layer and bottom density is greater than water layer density. (The equation is supplemented by ordinary boundary conditions.) It is further assumed that

the sea is deep and the speed of sound as a function of z has a single deeply
situated minimum. An important characteristic of the medium is the function
$D(\mu)$. It has a simple sense: it gives the horizontal period of the ray as
a function of μ. The behavior of the field is discussed with

$$r = \sqrt{(x - x_0)^2 + (y - y_0)^2} \gg r_{max}.$$

Particular attention is given to the

convergence zones, especially field structure in a distant convergence zone
(r d). Also examined is the structure of the acoustic field at such ranges
where the convergence zones considerably overlap ($r \leqslant d$). At such ranges
interference effects become exceedingly complex and averaging procedures
assume particular importance. In the case of greatly overlapping zones, with
the field averaged over some interval less than the characteristic ray period,
periodic peaks might appear against a background of cylindrical spreading.
This background has a maximum if the depths of the source and receiver
coincide. Figures 5; references 8: 7 Russian, 1 Western.
[208-5303]

MODERN PHOSPHORITIC SANDS ON SHELF OF GUINEA CONTINENTAL MARGIN

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[Abstract] Phosphorite-glauconite sands were discovered on the Guinea shelf
for the first time by a Soviet-Guinean expedition on the "Akademik Vernadskiy"
while working a test range situated between 9° and 19°45'N. The distribution
of sediments on the continental margin is complex and is determined mostly by
bottom relief (a map, Fig. 1, illustrates this complex pattern). For example,
in the shallow-water part of the shelf, to the isobath -10 m, there is a
predomonance of quartzy and quartz-feldspar sands, whereas at depths of 10-50 m
there are slightly carbonaceous and oozy sands. There is an extensive zone of
terrigenous sands of different grain size in the southern part of the range.
The phosphorite-glauconite sands and siltstones most enriched with phosphorus
occupy a zone measuring 20 x 100 km extending parallel to the shore; the median
size of the phosphorite grains in these sands is 0.25 mm. Along the continental
margin of Equatorial Africa there are both modern phosphorite-bearing sediments
and ancient eroded phosphorites. There appears to be no genetic relation-
ship between these two forms of phosphorite formation. The zones of maximum
phosphorus content in the sediments do not correspond to zones of maximum P
content in the water (500-800 m). The high P content in the water ensures a
significant concentration of phytoplankton, zooplankton, benthos and other
organisms in the water. Figures 1; references 3: 2 Russian, 1 Western.
[272-5303]

FIND OF RHEOLITES AND TRACHITES AND GEOLOGICAL SITUATION IN NORTHERN PART
OF EAST INDIAN OCEAN SUBMARINE RIDGE

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Sciences, Moscow

[Abstract] Most studies of the geological sturcture of the Indian Ocean
floor have suggested that the East Indian Ocean Ridge (90° Ridge) developed
as a transformed fault and that it is characterized by exclusively basic
volcanism. This article presents facts which contradict this. The data were
collected on the 24th cruise of the "Pegas" (1983) during dredging in the region
with the coordinates 1°9'N and 90°32'E. Highly modified volcanic-sedimentary
rocks were raised which can be classified as tuffites or tuff-siltstones.
Clastic material is represented by fragments of relatively little-modified
basalts, rhyolites, dacites and trachites, a small number of grains of quartz
and plagioclase and particles of ferromanganese encrustations. Sorting is
absent. A table gives the chemical composition of rocks from the clastic
fraction. Volcanic activity in the ridge is possibly continuing to the
present time, as indicated by an anomalously high heat flow. The northern
part of the ridge is characterized by seismic activity and manifestation of
recent tectonic movements, including displacement of crustal blocks. The
presence of rhyolites and trachites indicates that it is not basalts alone
which are present in the East Indian Ocean Ridge; acidic and subalkaline
effusives seem to be widespread. The association of basalts, rhyolites and
trachites indicates an island arc nature of volcanism in the region. Situated
to the east of the ridge is a trench with maximum depths greater than 6,000 m.
In the northern part of the trench there is an increased thickness of sedi-
ments. The total crustal thickness within the ridge remains uncertain, but
it is evidently not less than 23 km. The proximity of the ridge and trench
and the nature of volcanism reveal a similarity to systems of island arcs and
abyssal depressions in the Pacific Ocean. Figures 2; tables 2; references 14:
5 Russian, 9 Western.
[272-5303]

UDC 551.468:551.466.62

EVALUATING SCREENING EFFECTS AND TSUNAMI DANGER IN BAYS

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[Abstract] In selecting sites for new construction in the Kuril Islands it is
important to evaluate the tsunami danger of the pertinent parts of the coast-
line. Recommendations for the Kuril Islands have been published, but they
are only preliminary. An effort has now been made to improve them by formulat-
ing a more adequate model of the source with defining of those peculiarities
of the specific position of a bay which exert the most significant influence
on formation of the maximum tsunami wave in the analyzed coastal zone. The
analysis was based on observational data for the Kamchatka tsunami of 1952,
which was catastrophic for the shores of Kamchatka and the Kuril Islands. The
data used were for Pearl Harbor, Honolulu and Hilo. The processing method
involved breakdown of the record into the signal at the source and the impulse
function for penetration of the wave into a bay. It was found that the record
can be represented in the form of the convolution of the source function common
for all the records of one tsunami and the specific impulse function for the
propagation path specific for each bay. It was found that the signal at the
tsunami source is a periodic process with beats of great duration with a
relatively narrow spectrum. The impulse function for the paths for closed
bays contains a small number of oscillations and varies in characteristic
times on the order of 1-1.5 hours. The characteristic time of tsunami
filling of a bay is important to know for shielding the bay against a tsunami
wave. Figures 6; tables 1; references 17: 15 Russian, 2 Western.
[235-5303]

UDC 551.463.2+593.75

SOUND SCATTERING BY JELLYFISH

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[Abstract] Jellyfish have a soft, jellylike body whose elastic properties
differ little from the elastic properties of water. For this reason jellyfish
should only slightly scatter acoustic waves. However, the literature gives
very high backscattering section values close to those for fish with swim
bladders. Accordingly, experiments were made to determine the backscattering
section (σ) of jellyfish and their dependence on frequency (20-200 KHz) and

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irradiation aspect. The measurements were made with live jellyfish at a
Black Sea station. The jellyfish were caught by a diver and carried under
water to the measurement set-up. They were attached in a suspension system
and had no contact with the air, thereby precluding attachment to their
surface of any air bubbles which could significantly distort the measurement
results. Three rather large Black Sea jellyfish (length 20-30 cm) were
studied. All measurements were made when the length of the acoustic wave
was much less than the size of the jellyfish. The authors give a mathe-
matical model of a jellyfish as a sound scattere in the form of a sphere with
elastic parameters differing little from the ambient parameters. It is shown
that the scattering is caused for the most part by the differences between
the elasticity modulus of the scatterer and the elasticity modulus of the
medium. Estimates of the anticipated acoustic effect attributable to
individual jellyfish and their gatherings for different concentrations of
jellyfish are given. The total scattering level which can be created by
concentrations of jellyfish is considerable and the backscattering coefficient
in many cases exceeds 10^{-9}-10^{-8} m^{-1}, characteristic for the response limit of
acoustic instruments. Figures 6; references: 9 Russian.
[283-5303]

INFLUENCE OF SESTON PHOSPHATASE ACTIVITY ON RATE OF PHOSPHORUS
MINERALIZATION AND ITS RECYCLING IN PRODUCTION-DESTRUCTION CYCLE

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[Abstract] A study was made of the vertical distribution of organic phosphorus
and phosphatase activity in the southeastern Pacific Ocean. The rate of the
photosynthesis process is limited by the rate of freeing of phosphates in
the regeneration process. In a normally functioning community of oligo-
trophic waters the most important role in the mineralization of phosphorus
is played by microheterotrophs. In order to estimate the rate of phosphorus
regeneration a study was made of the enzymatic activity of alkaline phos-
phatase and the protein content in seston, as well as a determination of organic
phosphorus. A total of 290 synchronous determinations of organic phosphorus
and the rate of phosphorolysis were made at 17 stations which take in the
region of the open ocean along a 200-mile zone from 8°S to Drake Passage.
Comparison of the data indicates that the distribution of the total activity
of phosphatase differs considerably both vertically and in dependence on the
region. An estimate is made of the minimum times required for the recycling
of phosphorus. In all the investigated regions in the layer 0-200 m the
recycling of phosphorus occurs in the course of a 24-hour period. The con-
tribution of mesoplankton to the recycling of phosphorus is less than in the
case of microplankton, not only due to its lesser biomass, but also due to
a lesser specific activity of phosphatase. For phytoplankton there is a close

interrelationship between the activity of phosphatase and the level of in-
organic phosphate in the medium, a shortage of which induces this enzyme.
Studies of phosphatase activity in different regions of the Pacific Ocean
indicated that the rates of mineralization of organic phosphorus in the layer
0-200 m in oligotropic and eutrophic regions differ by a factor of 5-10,
whereas the recycling times of phosphorus in the production-destruction cycle
differ by a factor of only 2-5. This is attributable to a simultaneous in-
crease in the organic phosphorus and the rate of phosphorolysis in eutrophic
regions. Figures 1; tables 4; references 20: 6 Russian, 14 Western.
[283-5303]

ORIGIN OF ELEMENT COMPOSITION OF OCEAN WATER

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[Abstract] There is still no generally accepted theory on the origin of the
salt composition of the ocean. It is most widely accepted that anions enter
ocean water from the mantle, whereas cations enter with runoff from the
continents. It is not possible to explain all experimental facts on that
basis. The authors have derived a new expression which is useful in analyzing
the element composition of ocean waters and world river runoff, the objective
of such an analysis being to clarify whether the salt composition of oceanic
waters is a result of transport of elements from the continents or whether
it is a product of differentiation of mantle matter. A table was prepared
with data on the concentrations of elements in the ocean and in river runoff.
It was found that the concentration of elements in both ocean and lake-river
water is directly proportional to their volatilities. The cation composi-
tion of both types of waters includes products of the outgassing of the earth's
deep matter released as a result of its differentiation. Despite the uni-
versality of the source, the distribution of elements in the waters of the
oceans and continents conforms to different patterns. An attempt can be made
to explain this difference within the framework of concepts concerning the
relative youthfulness of the oceans, formed primarily by the products of out-
gassing of the earth's deep matter in the process of its fluctuating develop-
ment or expansion. In continental runoff waters, however, a significant con-
tribution is from the products of rock destruction. Figures 1; tables 2;
references 15: 13 Russian, 2 Western.
[266-5303]

THEORY OF SOLITARY ANTICYCLONES IN ROTATING FLUID

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[Abstract] An earlier study analyzed a solitary wave in the form of a local
thickening within which the fluid rotates in a direction opposite the rotation
of the planet (anticyclonically). Such an anticyclone moves opposite the
direction of planetary rotation (to the west) and is an analogue of a drift
soliton in plasma. An experiment with a thin layer of fluid in a rotating
parabolic vessel made it possible to produce long-live anticyclones called
Rossby solitons. The laboratory studies were made with a considerable thick-
ening of the fluid layer at the center of the eddy; in some cases the eddy
scale was 2-3 times less than predicted by the theory of solitary low-amplitude
waves. An effort has been made to explain this discrepancy. A study was
made of a wave moving westward with the velocity u in a thin layer of rotating
fluid. Equations are derived which describe solitary anticyclones moving to
the west and low-amplitude waves. Analysis of the derived system shows that
with a decrease in the phase velocity of a wave its amplitude decreases, the
horizontal scale increases and theorbital velocity becomes close to geostrophic.
It is shown that allowance for the finite amplitude of a solitary wave does not
eliminate the discrepancy between theory and experiment. As a result of
change in Coriolis force the eddy begins to be displaced westward. The anti-
cyclone moves more rapidly than linear Rossby waves and can be transformed into
a solitary wave. A cyclone moves more slowly than linear Rossby waves and as
a result of generation of Rossby waves cannot be transformed into a stationarily
moving solitary wave. The difference from an anticyclone is caused by a
decrease in the level in the cyclone. Due to the dispersion of Rossby waves
cyclonic eddies of the scale of the Rossby radius or more decay. Strong
cyclones must be regarded as nonstationary eddy formations weakly generating
Rossby waves. The difference between the dynamics of a cyclone and an anti-
cyclone is of considerable importance in the evolution of frontal rings in
the ocean. This difference is manifested most clearly in eddies within the
thermocline such as have been detected in recent years in different parts of
the ocean. Eddies within the thermocline are anticyclones and they can be
regarded as solitary internal Rossby waves. Figures 1; references 15:
10 Russian, 5 Western.
[266-5303]

NONLINEAR MODEL OF ADAPTATION OF FIELDS OF DENSITY AND CURRENTS IN SEA

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[Abstract] The fields of density, wind and sea floor relief determined from
observations are usually inconsistent with one another and this often results
in significant errors in computation of sea currents. Accordingly, the
authors have formulated a new approach in order to ensure the hydrodynamic
consistency of these fields while retaining the principal advantages of
diagnostic computations. In the first stage purely diagnostic computations
are made. Currents are computed on the basis of a priori stipulated density,
wind and bottom relief fields. A quasigeostrophic model is used as well as a
nonlinear model based on primitive equations of motion. In the second state,
the adaptation stage, the system of equations and boundary conditions of the
nonlinear diagnostic model are supplemented by a density diffusion equation
with corresponding boundary conditions and using the initial density field and
solution of the diagnostic problem as the initial approximation the computed
density and current fields are brought into consistency with the observed wind
and bottom relief fields. Having outlined this approach, the authors discuss
the results of numerical computations carried out for the western part of the
Black Sea, including the shelf zone. The studied region was covered by a
uniform grid with a 5-mile interval and 12 horizons (0-1,800 m) were con-
sidered. The initial density field data were taken from a hydrological
survey made in 1976. After illustrating the approach using these data, the
results are compared with other models. Figures 6; references 18: 14 Russian,
4 Western.
[235-5303]

LABORATORY STUDY OF REGULAR LOW-AMPLITUDE GRAVITY CAPILLARY WAVES IN
NONSTATIONARY CURRENT

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[Abstract] Laboratory experiments were carried out for studying the change in
wavelength, frequency and amplitude of regular low-amplitude gravity capillary
waves in the range 2-5 Hz in a slow sinusoidal current with a velocity
amplitude up to 10-15 cm/sec. The experiments were made in a glass flume

measuring 670 x 20 x 40 cm. A nonstationary uniform current was simulated by movement of a measurement carriage (on which a wave generator and sensors were mounted) along rails. Three electrode sensors were situated at a distance of 5, 20 and 25 cm from the wave generator. The accuracy in determining frequency and amplitude was 10 and 20% respectively; the accuracy in measuring wavelength was 10%. The generation of a current, changing with tiem, resulted in a change in all the parameters of the waves. Data are given for two ranges of current velocities: 10-15 cm/sec and 20-30 cm/sec. All the observations fit well within the framework of a linear kinematic model. A control experiment with a motionless carriage and a countercurrent slowly changing with time confirmed the legitimacy of transfer of the data obtained with the carriage moving relative to calm water to the case of a uniform non-stationary current. Figures 5; references: 5 Russian.
[283-5303]

EDDY FLUXES OF HEAT, VORTICITY AND MOMENTUM IN OCEAN AND ATMOSPHERE AND THEIR PARAMETERIZATION (REVIEW)

IVCHENKO, V. O. and KLEPIKOV, A. V., Arctic and Antarctic Scientific Research Institute

[Abstract] This review, based on 39 cited sources, gives a critical evaluation of the present status of the theory of eddy transfer of momentum, heat and vorticity in the atmosphere and ocean. Despite differences in the regimes characteristic for the ocean and atmosphere, it is possible to analyze the principal ways to solve this problem on a common basis. Systematization of studies on the parameterization of vertical fluxes in macroscale circulation models suggests that four principal directions must be pursued. 1) Obtaining asymptotic solutions for model situations. (Using an expansion of the sought-for hydrodynamic functions in a small parameter it is possible to obtain solutions for the vertical fluxes of heat and momentum related to unstable baroclinic waves.) 2) Use of a diffusional scheme for the parameterization of vertical fluxes. (By "diffusional parameterization" of the vertical flux of some substance is meant the proportionality of this vertical flux to the mean gradient of the considered substance.) 3) Studies of so-called orientation effects. (Systematic, nonrandom rotations of elements of a fluid.) 4) Derivation of expressions for the zonally averaged vertical flux of momentum. (This involves hypotheses related either to the baroclinic nature of eddy formation or interaction of baroclinic waves and determination of their phase velocity.) Each of these directions (and the corresponding literature) is critically examined. References 39: 8 Russian, 31 Western.
[283-5303]

STUDY OF INFLUENCE OF VERTICAL VELOCITY AND DENSITY PROFILES ON HYDRODYNAMIC
STABILITY OF ZONAL FLOW

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[Abstract] Within the framework of the linear theory of hydrodynamic
stability and on the basis of a three-layer model of a zonal current with
transverse velocity shear a study was made of the joint influence of curvature
of the vertical velocity and density profiles on the parameters of unstable
wave disturbances and the findings were compared with theoretical studies
made earlier and data from in situ observations. The problem is formulated
as follows: there is a three-layer macroscale current (with small Rossby-
Kibel' numbers $Ro \ll 1$) on the β-plane not bounded along the longitudinal
coordinate X, directed to the east, and having the width L along the transverse
coordinate Y, directed to the north, with the Z axis being directed vertically
upward. In this formulation a system of equations is derived which is free
of shortcomings present in earlier attempts to solve this problem. This
makes it possible to study the influence of the vertical curvature of the
density profile, related to the simultaneous existence of a seasonal thermo-
cline and constant pycnocline, as well as the influence of curvature of the
vertical velocity profile arising in the presence of subsurface velocity
maxima. The system of equations is solved numerically. It is shown that the
most unstable wave disturbances arise in the presence of a subsurface maximum
of velocity of the main current. These findings are illustrated in computa-
tions of parameters for the main Black Sea current. Figures 4; references 13:
9 Russian, 4 Western.
[283-5303]

FEATURES OF GEOSTROPHIC CIRCULATION RELATED TO NATURE OF BOTTOM RELIEF IN
NORTHWESTERN ATLANTIC

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and Oceanography, Moscow

[Abstract] A study was made of the influence exerted by bottom relief on a
boundary current and the geostrophic circulation of the ocean in the neighbor-
hood of its western shore. The investigation was made within the framework
of the Ekman theory of wind currents in a barotropic ocean. The conditions
characteristic for the northwestern shore was simulated; the sector from
Florida to Georges Bank was considered. The modeling revealed that since to

the north of Cape Hatteras the depth drops off smoothly from the abyssal
plain to the outer edge of the shelf almost to zero, under some conditions
the isolines of the f/H function (f is the Coriolis parameter, H is depth)
near the continental slope can capture the geostrophic flow, making it
virtually parallel to the edge of the shelf, this resulting in the weaken-
ing and disappearance of the western boundary current. There is little basis
for expecting such a strong topographic effect as detachment under baroclinic
conditions, which are clearly expressed in the subtropical latitudes, parti-
cularly near the western shore (baroclinicity to a considerable degree
suppresses the bottom relief effect on a current within the limits of the
main thermocline). The described effect of capture of the geostrophic flow
near the western shore is also possibly manifested in the South Atlantic.
Figures 3; references: 10 Russian,
[283-5303]

CYCLONIC FRONTAL EDDY IN ANTARCTIC CIRCUMPOLAR CURRENT

IVANOV, Yu. A., KRASNOPEVTSEV, A. Yu., MOROZOV, Ye. G., SHADRIN, I. F.
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[Abstract] Studies of the Antarctic Circumpolar Current were made in
December 1982-February 1983 on the 30th cruise of the "Dmitriy Mendeleyev"
in the waters between New Zealand and Antarctica. Two hydrological surveys
in the broad frontal zone of the current revealed a cyclonic eddy of the
frontal type. The article discusses the structure and kinematics of the
eddy and analyzes the nature of its evolution. This eddy could be traced
in the field of all hydrological characteristics. Against a background of
water with a temperature of about 6°C surrounding the eddy, the temperature
at the center drops to 1.6°C. The horizontal scale of the ring can be
determined from the peripheral closed isotherm. In the first survey the
axes were 90 and 60 miles; in the second 80 and 50. During the time between
the surveys (15 days) the center of the eddy moved 80 miles to the northeast,
giving a velocity of 5.3 miles/day. The polar front separating the antarctic
and subantarctic water structures possibly forms a meander extending to 58°S.
The young ring discussed may have been formed as a result of sepration of this
quasistationary meander. The geostrophic velocities in the ring were computed
by the dynamic method, the maximum values being 40 cm/sec. The two time-
spaced surveys made it possible to compute the Lagrangian evolution of ring
characteristics, specifically the available potential energy, heat and salt
content. Since the mean temperature of the cold ring increased, this is
evidence of its dissipation; its available potential energy increases,
indicating ring intensification. As indicated by an analysis of the T, S
structure, chemical and biological characteristics, the cold eddy was formed

to the southwest of the place of its detection. Then it began to move to
the northeast under the influence of the mean flow and internal dynamic
factors. The intensification of cold rings was observed for the first time
in the ocean. It is clear that frontal eddies play a key role in the
meridional exchange of properties in the interfrontal zone of the
Antarctic Ocean. Figures 3; tables 2; references 3: 1 Russian, 2 Western.
[283-5303]

ELEMENT COMPOSITION OF CHLOROFORM EXTRACTS OF DISSOLVED ORGANIC MATTER IN
WATERS IN NORTHWESTERN PART OF INDIAN OCEAN

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[Abstract] The composition of the "lipid" fraction of dissolved organic
matter (DOM) is essentially dependent on the type of solvent used in extraction
and the lesser the polarity of the solvent, the lesser will be the polarity of
the extract. Most studies of DOM with low polarity have been made on the
assumption that their basis is nontransformed and little-transformed lipids.
The validity of this assumption has remained untested. Accordingly, a study
was made to obtain some idea concerning the element composition of DOM with
low polarity, its possible variations and correspondence to the composition
of DOM with low polarity. The literature contains no data on the element
composition of the "lipid" fraction of DOM in sea and ocean water. In addi-
tion to use of the traditional method for determining the element composition,
andattempt was made of use the proton magnetic resonance method for this
purpose. Chloroform extracts were taken from the waters of the northwestern
Indian Ocean on the 22d cruise of the "Akademik Kurchatov." Thirty-five
samples were taken from nine stations using a stainless steel bathometer.
It was found that there are waters for which the fundamental assumption of a
lipid composition of DOM withllow polarity is not satisfied. Accordingly,
a single value of the coefficient for scaling C_{org} into an absolute concen-
tration cannot be adopted. The applicability of the proton magnetic
resonance method for this purpose was demonstrated; it is highly promising
because of its high response and total conservation of the sample during analysis.
Figures 2; tables 2; references 18: 10 Russian, 8 Western.
[283-5303]

GEOCHEMICAL CHARACTERISTICS AND DIAGENETIC EVOLUTION OF ORGANIC MATTER IN BALTIC SEA BOTTOM DEPOSITS

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[Abstract] Joint geological and geochemical research was carried out by the Oceanology Institute in the Baltic Sea in 1978. Specialists on the 26th cruise of the "Akademik Kurchatov" took samples of suspended matter and bottom sediments from different depths of the sea. The objective was a study of the nature, geochemical characteristics and transformation of organic matter in the stages of formation of sediments and early diagenesis. The suspended matter was taken by separators from the water layer 0-7 m. Bottom samples were taken by corers. The study was based on four samples of suspended matter and 25 samples of sediments from 5 cores. Samples were taken from the Gotland and Bezymyannaya Basins and the Gulf of Riga. The composition and genetic characteristics of the sediments were determined by lithological-stratigraphic and biostratigraphic methods. For the first time it was demonstrated that the transformation of suspended organic matter is expressed not only in the loss of its most labile components, but also in an increase in the glutamic acid content of the hydrolyzable components and amino acids. The composition and distribution of amino acids, n-alkanes and polynuclear aromatic hydrocarbons are evidence of the molecular inheritance of the structure of the organic matter of sediments from suspended matter. In the sediments of the marine Holocene in the Baltic Sea basins diagenetic changes do not result in any significant change in composition of organic matter. Diagenetic transformations of organic matter have occurred most intensively in the homogeneous and varved clays of the Upper Pleistocene in the Gdansk and Gotland Basins. Genetically the general tendency of geochemical changes in the composition of organic matter with an increase in depth into the Holocene-Pleistocene sediments is expressed in a decrease in the role of the terrigenous organic component. These findings are important in understanding processes of evolution of organic matter in diagenesis and can be useful in paleogeographic reconstructions. Figures 3; tables 1; references 13: 10 Russian, 3 Western.
[283-5303]

INFLUENCE OF SOME OCEANOGRAPHIC CHARACTERISTICS ON DECAY KINETICS OF
SURFACE-ACTIVE AGENTS IN SEA

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[Abstract] Those parameters which constitute conditions for the vital func-
tioning of microorganisms, such as temperature, salinity, illumination and
oxygen regime, play the decisive role in processes of destruction of surface-
active agents. This article gives an experimental study of the role of these
marine parameters in the process of biodegradation of surface-active agents.
Two methods of model research were employed in the experimental work:
static laboratory modeling in open and closed glass containers and the in
situ method with polyethylene or polyvinyl chloride spheres exposed during the
entire experiment in the sea and supplied with valves and devices for taking
samples. The object studied was the "Progress' washing compound, one of the
most commonly used Soviet-produced surface-active agents, the active substance
being sodium alkyl sulfate. In both the model and in the in situ experiments
the rate of the process of decay of alkyl sulfates was monitored by a
determination of their content in daily samples by the method of photo-
colorimetry with methylene blue. A study of the kinetics of decay of alkyl
sulfates in the temperature range from 0 to 36° revealed that at temperatures
0-2°C the biodestruction process is slowed down greatly. A temperature in-
crease to 16°C results in a strong increase in the rate of destruction, but
with a further temperature increase by each 10° the decay rate increases by a
factor of approximately 2. The kinetics of degradation of alkyl sulfate in
the insitu models varies in dependence on the content of biogenous substances
and other factors causing seasonal variability of the biological activity of
waters. The decay constants of surface-active agents determined in different
sea areas during the spring-summer differ by a factor of approximately 2.
The results are of interest in evaluating the capcity of the sea to be self-
purified from surface-active agents, taking into account the spatial and
seasonal variability of these factors. Figures 4; references: 10 Russian.
[283-5303]

PHYSICOCHEMICAL PREMISES FOR USING DISPERGENTS IN CONTENDING WITH
PETROLEUM SPILLS

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[Abstract] The DN-75 dispergent has undergone thorough toxicological testing
with exposure to hydrobionits at different trophic levels, but the influence
of dispergents on the process of self-purification of a water body, especially
on the kinetics of oxidation of spilled petroleum products, has been poorly
studied. With emphasis on DN-75, the article describes a laboratory study of
the influence of dispergents on the rate of biochemical oxidation and
degradation of petroleum products. Sea water with a salinity of $15°/oo$ was
placed in cylindrical containers and then polluted with petroleum. Then
DN-75 was added to half the samples in a dispergent/petroleum ratio 1:10.
The content of hydrocarbons in the samples was determined by the IR
spectroscopy method at definite intervals after exposure to the light.
The total quantity of losses of hydrocarbons due to different factors
(evaporation, biodegradation, chemical oxidation) with and without DN-75 was
determined. The samples with DN-75 revealed that the rate of petroleum
decomposition increases. The exact mechanism of the effect is discussed.
It is demonstrated that the surface and volumetric properties of such dis-
pergents make it possible to reduce the thickness of a petroleum film to a
minimum, destroy it and transform it into a stable emulsion, thereby restoring
heat-, energy-, gas- and mass exchange of water with the atmosphere.
Figures 1; tables 4; references 10: 7 Russian, 3 Western.
[283-5303]

COMPUTATIONS OF SEISMIC WAVE PROPAGATION VELOCITIES IN OCEAN BOTTOM SEDIMENTS
FROM REFLECTED WAVES TRAVEL-TIME CURVES

MOSKALENKO, V. N., SEMENOV, G. A. and KUZ'MIN, P. N., Oceanology Institute
imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] The velocity of seismic waves in a thin layer of sediments in the
ocean is usually determined using the approximate Dix formula, but the latter
has a number of limitations in large part attributable to its derivation.
These limitations are reviewed. In its derivation use was made only of the
first two even terms in the expansion of the travel-time curve for reflected

waves. S. N. Medvedev found a more precise analytical expression for velocity which is derived using the first three terms of the expansion. The Medvedev algorithm, outlined in this article, was checked in a theoretical model and using experimental data obtained on the 28th cruise of the "Dmitriy Mendeleyev." The Dobrinskiy program was used in solving the direct seismic problem for horizontally bedded thick layers with a constant velocity and theoretical travel-time curves were computed from the bottom of sedimentary layers of different thicknesses; these theoretical travel-time curves were then introduced into a program for the inverse seismic problem. It is shown that the Medvedev algorithm makes it possible to compute the stratum velocities of propagation of seismic waves in thin sedimentary layers of theocean with an accuracy to 0.05 km/sec. A distinct advantage of this algorithm is that there is no need to know the distances from the radiation point to the reception point. The algorithm uses only the times of two travel-time curves from the boundaries of the sedimentary layer between which it is necessary to determine the stratum velocity of seismic wave propagation. A program for computing stratum velocity in this layer was prepared on this basis. This program, in FORTRAN, has been adopted at the Oceanology Institute computer center. Figures 1; tables 3; references 4: 2 Russian, 2 Western.
[283-5303]

ROLE OF AHERMATYPIC CORALS IN SEDIMENTATION AND ECOLOGY OF CORAL BANKS

KELLER, N. B., Oceanology Institute imeni P. P. Shirshov, USSR Academy of Sciences, Moscow

[Abstract] Ahermatypic scleractiniae, not forming coral reefs, occur widely as individuals and in colonies, the skeletons in the latter being very similar to those of some hermatypic corals and being very difficult to distinguish from the latter in fossil form. Ahermatypic deep-water scleractiniae are adapted to different depths as great as 6,200 m and different temperatures down to -1.1°C. Locally in the oceans they form dense colonies in the form of banks or coral overgrowths or "meadows," in the latter case playing a significant role in the formation of sediments. The largest such coral colonies form on the shelf and on seamounts: at 600-700 m on the Patagonian shelf--"Akademik Kurchatov"; Victoria Land shelf--"Ob'"; Great Meteor seamount-- "Vityaz'." An important summary on large concentrations of colonial ahermatypic corals forming rich coral banks in the North Atlantic was given by C. Teichert in BULL. AM. ASSOC. PETROL. GEOL., Vol 42, No 5, pp 1064-1082, 1958. If such banks rise to shallow depths critical for the scleractiniae the latter perish and in many cases are covered over by terrigenous sediments. The death of these corals can also be caused by changes in currents and related

changes in aeration, food supply and arrival of terrigenous sediments.
The fluorishing of ahermatypic colonial scleractiniae, forming coral banks,
requires completely different ecological conditions than for the externally
similar colonial hermatypic corals capable of forming true reefs in the
tropical zone. Coral banks and overgrowths in fossilized form constitute
calcareous bodies of sedimentary origin: bioherms up to 60 m thick and up to
3 km in extent; there are biostromes in the form of relatively thin lenses
with an extent from tens to several hundreds of meters. A study was made
to ascertain how the geologist can distinguish bioherms and biostromes of
abyssal, cold-water origin from tropical zone bioherms and reefs. It was
found that the presence of coral bioherms and biostromes in rocks, even in
the presence of rich and diversified accompanying invertebrate fauna, in it-
self is not an indicator of definite ecological conditions such as depth,
temperature and latitude. Each individual case requires a careful analysis
because these formations can arise in different bathymetric and latitude
zones in the ocean. References 18: 1 Russian, 17 Russian.
[283-5303]

UDC 551.462.6(265.1)

NEW DATA ON RELIEF OF NAZCA RIDGE

ZAKHAROV, L. A., Zaprybpromrazvedka Administration for Fishery Exploration
and the Western Basin Scientific Research Fleet

[Abstract] The Nazca Ridge is of particular interest because many aspects
of the origin, development and structure of block-volcanic ridges as a whole
do not fit in with the hypothesis of the tectonics of lithospheric plates.
In addition to data from earlier work, this study of the Nazca Ridge is based
on 24 computer-processed profiles of the ridge with a total extent of more
than 2,500 miles (all available data were used in compiling a bathymetric
chart of the region, Fig. 1). Four principal parameters were determined:
slope, horizontal and vertical dissection, mean depth level. The area dis-
cussed extends from 17°S, 77°30'W to 26°S, 86°W. The Nazca Ridge, like the
Walvis Ridge in the Atlantic, is broken into large macroblocks: northern
(15-19°S); central (19-23°S); southern (23-26°S). Each is distinctly
different. The northern macroblock has a base at a considerable depth,
minimum elevation and minimum vertical dissection. The central macroblock
rises to the greatest elevations above the surrounding Peruvian and Chilean
Basins, has considerable vertical dissection and a maximum slope steepness.
There are mountains of typical volcanic characteristics, some with flat tops,
The distinguishing characteristic of the southern macroblock is a predominance
of mountains of volcanic origin, many of which are typical guyots, evidence of
a relatively recent sinking of this part of the Pacific Ocean floor. It

appears that the structure of the Nazca Ridge has a different genesis in its different parts. Between 15 and 23°S there is a massive block structure, possibly of horst origin. The structure of the sector to the south of 23° is predominantly of volcanic origin. Figures 2; references 13: 8 Russian, 5 Western.
[283-5303]

TERRESTRIAL GEOPHYSICS

GEOPHYSICS CONFERENCE FOCUSES ON MINERAL PROSPECTING

Leningrad LENINGRADSKAYA PRAVDA in Russian 28 Mar 85 p 1

[Article by V. Vasil'yev]

[Text] More than 200 specialists from dozens of scientific research
institutes and geological surveying organizations took part in the All-
Union Scientific-Technical Conference of Geophysicists which was held in
Leningrad.

Geophysical methods of prospecting and surveying mineral resources have been
receiving broader and broader use in recent years. Study of magnetic,
gravitational and electric fields and other physical fields has become a
reliable aid to geologists in their work.

Participants in the conference devoted particular attention to the develop-
ment of new methods and geophysical work. Questions of heightening the
sensitivity of instruments and automating prospecting processes held the
center of attention at the conference. Principal ways of accelerating
technological progress in the field of geophysical studies for the 12th
5-Year Plan were determined at the conference.

FTD/SNAP
CSO: 1865/303

GROUND-WATER DETECTING UNIT "GIDROSKOP"

Moscow NTR: PROBLEMY I RESHENIYA in Russian 5-18 Mar 85 p 2

[Text] A fundamentally new unit for directly detecting and assessing water underground without the drilling of boreholes has been developed at the Institute of Chemical Kinetics and Combustion of the USSR Academy of Sciences' Siberian Branch. This unit, which has been given the name "Gidroskop", "sees" water at depths as great as 100-150 meters.

Operational efficiency and the low cost of information that is obtained are the unit's principal merits. It is particularly valuable when used for prospecting thawed water-bearing layers between layers of frozen ground.

(A photograph was given showing A. V. Legchenko, senior engineer of the Institute of Chemical Kinetics and Combustion, debugging a new program for processing results of measurements with the "Gidroskop".)

FTD/SNAP
CSO: 1865/328

GRAVIMETRIC SURVEYING WITH MI-8 HELICOPTERS

Moscow VOZDUSHNYY TRANSPORT in Russian 18 Apr 85 p 4

[Article by V. Sopolev]

[Text] A new type of geophysical operation--gravimetric surveying from MI-8 helicopters with the aid of suspended gravimeters--has been mastered for the first time in the country by Far East helicopter crews. In this method, all work is performed by an operator inside a helicopter carrying a gravimeter on an outside sling. The gravimeter is equipped with a stabilizing device.

Work with the suspended gravimeter requires considerable flying skill and highly precise piloting during approaches and hovering. Not without reason was this work assigned to crews of the team headed by Vladimir Vasil'yevich Muzyka, one of the most experienced pilots and a Hero of Socialist Labor.

FTD/SNAP
CSO: 1865/328

UNDERGROUND CONDITIONS NEAR KISHINEV MONITORED

[Text] 19 Mar [TASS] A high-precision station for monitoring underground conditions has been built in one of the old mines near Kishinev, with up-to-date geophysical instruments on round-the-clock watch.

A seismological research headquaters has been situated in a stone labyrinth 1.5 km long at great depth, whence run very fine conductors to various parts of the mine-like tentacles. Diverse information returns along these from tens of sensors to the registering instruments.

These include a unit measuring ground and atmospheric electricity, which takes measurements every twenty minutes—twice as frequently as usual. This mode has been selected in order to obtain fuller information.

The complex could not function efficiently on the Earth's surface - its readings would be affected by various obstacles: rain, for example, or electric wires which have fallen to the ground.

The center includes apparatus for monitoring changes in the earth's magnetic field. The instruments are very sensitive to temperature changes and the old mining gallery is therefore an ideal place, as it is not subject to such changes, and the earth layer above the mine protects the station from magnetic barriers.

It is planned to install an underground computer with a signaling system for recognizing catastrophic earthquakes at the first earth tremor from the Carpathians, the cradle of many underground upheavals. This will enable electricity grids to be switched off and the population to be warned before the tremors.

A seismic data bank created in the republic is of great help in forecasting earthquakes. The computers store information on underground squalls which have taken place in the Carpathian-Balkan region since the beginning of the century.

CSO: 1865/287

FRUNZE UNDERGROUND GEOSEISMIC LABORATORY

[Article: "Seismology in Soviet Kirgizia"]

[Text] Frunze, 15 Mar [TASS[. An underground geoseismic laboratory has been set up near Frunze. Its aim is to help to predict earthquakes by registering changes in magnetic fields, the electrical resistance of the ground and the chemical and gas content of subterranean waters. Seismic study of the Tien Shan is now so advanced that the epicenters and force of impending earthquakes can be predicted. Specialists have concluded that the epicenters of earthquakes are moving along faults in the earth's crust and that tectonic changes move in 100-year cycles.

Seismologists have established that along the two major Central Asian faults - Gisaro-Kokshaal and Darvaz - Karaku, the rate of the underground movement is 4-5 km per year, and 30 mobile seismic, geomagnetic, electrometric and seismogeochemical stations monitor these areas of possible earthquakes.

In recent years no earthquake in the Tien Shan has come as a surprise, so timely evacuation of people and damage limitation has been possible.

CSO: 1865/288

DEEP-LEVEL GEOLOGICAL PROBING WITH MHD GENERATOR

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Apr 85 p 4

[Article by V. Proshkin]

[Excerpt] The Barents Sea was still covered with early-morning mist when the command "Launch!" rang out, and the roar of rocket engines was heard on the shore. On this occasion, however, scientists needed rockets not for a flight into space but, on the contrary, for a 'trip' underground.

"These solid-fuel rockets are part of a powerful magnetohydrodynamic unit," related Doctor of Physical-Mathematical Sciences M. Zhdanov, head of the department of the deep-level electromagnetic studies of the USSR Academy of Sciences' Institute of Earth Magnetism, the Ionosphere and Propagation of Radio Waves (IZMIRAN). "Academician Ye. Velikhov suggested that electro-magnetic probing of the Earth's interior be conducted with the aid of such a unit. The energy of ionized gas bursting from the rockets' nozzles is con-verted into electric current and reaches a tremendous intensity during the seconds that the generator is in operation. Two aluminum cables run down into the sea from both sides of the narrow isthmus that connects the Sredniy Peninsula with the mainland portion of the Kola Peninsula. These grounding electrodes, which are separated by a distance of about 10 kilometers, form a gigantic 'fork' that literally plugs the MHD generator into the sea.

"In a brief period of time, the MHD generator developed an enormous power--up to 40,000-60,000 kilowatts," explained M. Zhdanov.

"Calculations made by associates of the Geology Institute of the USSR Academy of Sciences' Kola affiliate and the Institute of Atomic Energy imeni Kurchatov indicate that even in the most dangerous place, right next to the grounding electrodes, the density of current in the sea does not exceed the permissible level that is harmless to living organisms. Moreover, the generator does not operate for long--no more than 10 seconds."

Processing of the initial results already has made it possible to draw an unexpected conclusion. It has been found that the Kola Peninsula is composed not of a single crystalline shield but mostly of 10 large blocks, and that the conductance of sedimentary rocks on the coasts of the peninsula is far greater than was previously supposed.

In order to reveal all of the practical advantages of using MHD generators in geology, a large group of scientists headed by Academician Ye. Velikhov had to accomplish a considerable number of difficult tasks, including the creation of a new base for measurements and quite different methods for theoretical analysis and interpretation of results. Lastly, the size and shape of the field that the MHD generator would create had to be determined prior to the experiment. A major role in this work was played by scientists of the Institute of Atomic Energy imeni Kurchatov, the Geology Institute of the USSR Academy of Sciences' Kola affiliate, IZMIRAN, and the USSR Academy of Sciences' Special Design Bureau of Physics Instrument building.

Laboratory modeling of the experiment with a miniature copy of the Kola Peninsula was of great importance for interpreting the experimental data.

"We replaced the sea with a metal plate and the land with materials that are poor conductors," related Candidate of Physical-Mathematical Sciences A. Lisin, head of a laboratory of the Institute of Atomic Energy imeni Kurchatov. "In place of the MHD generator, we used an ordinary current rectifier connected to a power supply system."

The "Khibiny" experiment is continuing. A test area is being operated on the Kola Peninsula. New level electromagnetic probing are being tested here.

FTD/SNAP
CSO: 1865/303

UDC [550.382.549.01]:622.24(479.24)

MAGNETIC MINERALS AND CHARACTERISTICS OF NATURAL MAGNETIC STATE OF CORE IN
SAATLY SUPERDEEP HOLE IN DEPTH RANGE 3500-7500 m

BAGIN, V. I. and NOVRUZOV, Z. A.

[Abstract] The SG-1 Saatly superdeep hole is one of the 15-km holes being
drilled or which will be drilled fot studying the deep structure of the earth's
crust. Special geological-geophysical and geochemical studies of the core
from the Saatly hole are now in progress, directed to investigation of the
mineralogical composition of the rocks, conditions of their origin for
clarifying the nature of geophysical boundaries and detection of ore shows.
This article presents data on magnetic minerals, carriers of natural
remanent magnetization and determinations of the conditions under which
they originated. Core rocks from depths of 3,500-7,500 m were used in the
study. These are andesites, andesite-basalts, basalts, dacites and others
(a total of 120 samples were analyzed). The samples were selected on the
basis of a preliminary petrographic analysis. Data on Curie temperatures
(T_C) and other parameters were analyzed in depth. The constancy of the
composition of magnetic minerals (magnetite with T_C = 575-585°C, magnetite
with a low content of titanium with T_C = 520-550°C and oxidized magnetite
with T_C = 600°C), found in the entire studied depth range, and its stabilitty
to temperature effects indicate not only a predominance of high-temperature
oxidation, but also a constancy of conditions at the source of removal of
the material. It is clear that the magnetic properties of the rocks are
related primarily to large grains whose size can vary from a few microns to
hundreds of microns. This is evidence of relatively calm depth conditions
of their crystallization with subsequent high-temperature oxidation. A
rapid cooling of the rocks with the manifestation of low-temperature oxidation
is possible for individual horizons in the core. Tables 1; references:
6 Russian.
[265-5303]

NEW METHODS FOR INTERPRETING SEISMIC WAVES IN STRATIFIED MEDIA

LUTSENKO, B. N., Geological Prospecting for Petroleum Institute

[Abstract] In order to ensure the most complete exploitation of petroleum deposits it is essential to develop new methods for the study of faults and the steep slopes of salt domes. The author describes a method for achieving this goal. This involves interpretation of reflections directly from fault zones: direct waves from the boundaries of fault zones and doubly reflected waves (those forming first by reflection from a subvertical boundary and then from the subhorizontal boundaries adjacent to them). It is shown that the formation of such duplex waves does not require that the entire subvertical boundary be continuously reflecting; it is only required that its individual elements in the neighborhood of the contacts with the subhorizontal boundaries have reflecting properties. The dynamics and kinematics of formation of these dual waves were examined in earlier studies by the author (EI VIEMS: SER. REGIONAL'NAYA I RAZVEDOCHNAYA GEOFIZIKA, Moscow, No 18, pp 14-22, 1979; No 13, pp 25 36, 1980). The discrimination and interpretation of such waves is possible in virtually the entire range of studied depths for seismic prospecting and petroelum exploration and also in deep seismic soundings. Each of these possibilities is illustrated in examples. For example, the new method can be applied in detedting subvertical contacts in the search for structurally screened petroleum and gas deposits and salt domes in the Dnieper-Donets and Caspian regions. Figures 4; references: 5 Russian. [273-5303]

NEW APPROACH TO SOME PROBLEMS IN SEISMOLOGY

KERIMOV, I. G.

[Abstract] Profound changes have occurred in seismology in recent years with respect to certain concepts which earlier had been unquestioned. Among these concepts are those regarding the pattern of distribution of earthquakes, the theory of propagation of weak high-frequency signals and the mechanism of induced seismicity. Each of these topics is discussed. For example, it has been generally accepted that the curve of the dependence of the number of earthquakes on their magnitude has a shape close to a hyperbola: the stronger an earthquake, the less frequently it occurs. But 72% of all

earthquakes are plotted in depth to depths of 400-450 km with an interval of 10 m earthquakes with M = 4.8-4.9 are most characteristic in all depth intervals. This casts a new light on the subject. In such a distribution . the stratification of the upper part of the earth plays the most important role in a seismogenic sense. Since M = 4.8-4.9 corresponds to blocks measuring 12-15 km, layers alternate specifically with such a periodicity. In seismogenic respects the earth is homogeneous both over its surface and in depth. A study of weak seismic fields during the time directly preceding earthquakes has revealed definite amplitude and frequency changes in the process of preparation for the main earthquake tremor. There is a characteristic dropoff in the amplitude level before the process begins to intensify continuously, up to the time of occurrence of the main tremor. Attenuation of the seismic field is observed at any distance from the focus (everywhere on the earth's surface). This attenuation can serve as a prognostic criterion because it is observed in all frequency ranges with definite time intervals. During the first period of radiation of microseisms by the focus there is an interaction between the medium and the field of weak oscillations at each stipulated surface point, this being characterized by a general drop ff of field energy. The process is later stabilized, followed by a continuous increase in amplitudes up to total discharge of focal region energy. New revelations concerning the correlation of weak seismic fields and electromagnetic radiation during the period of direct preparation for an earthquake and concerning induced seismicity are leading to substantial revision of concepts concerning planetary seismicity. Figures 2; [265-5303]

METHOD FOR SOLVING PROBLEMS IN ELECTRODYNAMICS OF ANISOTROPIC MEDIA WITH SLANT BEDDING

SAVIN, M. G., Computer Center, Far Eastern Scientific Center, USSR Academy of Sciences

[Abstract] This is a further development of the methodology for solution of electrodynamic problems for the case of gradient anisotropic media when the axes of the medium form quite small angles with the surface. This model approximates the geoelectric situation in the crystalline structures of the Baltic shield, where there is a contancy of the tilt of ancient rocks at angles from 45 to 60° to a depth of 11 km. The problem is examined in relation to work with pulsed magnetohydrodynamic generators. A geoelectric structure containing one-dimensional anisotropic layers is considered. The structure is assumed to be uniaxial, with the dielectric constant and magnetic permeability being continuous functions only of the z-coordinate. A method for solving electrodynamic problems is given for such media (the

generalized functions method is employed). A fundamental solution is
given for a system of Maxwell equations, represented in the form of a
convergent series, whose terms are computed using recurrent formulas.
References: 15 Russian.
[290-5303]

FEATURES OF FIELD OF DIRECTIONS AND VELOCITIES OF PROPAGATION OF FRACTURES
AT EARTHQUAKE FOCI IN NORTHERN MUYA REGION OF BAYKAL RIFT ZONE

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Department, USSR Academy of Sciences

[Abstract] In an earlier article (VULKANOLOGIYA I SEYSMOLOGIYA, No 4,
pp 79-92, 1983) the authors proposed a method for determining the directions
and velocities of propagation of fractures at the foci of earthquakes which
is based on a joint analysis of their mechanism and the distribution of
apparent periods at seismic stations in the region. The method has now been
applied to the Baykal rift zone, specifically the Northern Muya region,
within which there is an inversion of the field of directions of fracture
propagation. The characteristics of this region are discussed in detail;
Fig. 1 is a map showing the field of directions of fracture propagation
at earthquake foci in the Baykal rift zone, with the studied area clearly
set off; Fig. 2 gives corresponding information for the study area. In
this area the velocities and directions of fracture propagation were
determined at the foci of 247 earthquakes. In the analysis the data were
classified into three groups: 1) those foci at which the direction of
fracture propagation has a westerly component; 2) those with an easterly
component; 3) those for which the direction of propagation could not be
ascertained with certainty. The four characteristic zones were defined.
These analyses revealed that the Northern Muya region is actually a place
where there is a reorientation of the directions of fracture propagation.
The change in direction occurs in the neighborhood of the Pereval'nyy fault.
Whereas in zone I most of the foci have a westerly component, in zone II
the relationship between the number of foci with different directions is
evened out. With transition to zone III a great many foci already have
an easterly component, but there is still a high percentage of foci with
the opposite direction. In zone IV most earthquakes have foci with an
easterly component. It is between zones II and III (Pereval'nyy fault)
that the inversion of the field of directions occurs. Figures 4; tables 2;
references: 4 Russian.
[291-5303]

PETROLOGY OF PRODUCTS OF ERUPTION OF KLYUCHEVSKIY VOLCANO (PREDSKAZANNYY OUTBURST, 1983)

KHRENOV, A. P., ANAN'YEV, V. V., BALUYEV, E. Yu., LITASOV, N. Ye. and OZEROV, A. Yu., Volcanology Institute, Far Eastern Scientific Center, USSR Academy of Sciences

[Abstract] During the lateral eruption of Klyuchevskiy volcano in March 1983 lava periodically gushed from an eruptive center at an elevation of 2,875 m and flowed downslope. More than 0.15 km^3 of lava of basaltic composition was ejected. Genetically this lateral breach, called the Predskazannyy outburst, can be classified as a lava bocca. A thorough analysis of the products of this eruption revealed that the mineral composition of the phenocrysts of dark-colored minerals, like for the 1st-generation plagioclase, remained constant during the course of the entire eruption. However, in the final stage of the event (when the lava flow was minimal) there was an increase in the quantity of 2d-generation plagioclase. The 1st-generation plagioclases, clino- and orthopyroxenes and olivine phenocrysts were subliquidus phases crystallizing at temperatures of about 1100°C, at pressures no greater than 2.5 kbar and with a fugacity of oxygen between $1.73 \cdot 10^{-11}$ and $1.35 \cdot 10^{-9}$. The crystallization of phenocrysts of 2d-generation plagioclases and most of the phenocrysts of olivine and pyroxenes was at a temperature of about 1090°C and a pressure of 3.0-3.5 kbar at the time of separation of the gas phase from the melt. The constancy of the chemical composition and mineral associations of phenocrysts and micro-lites during the eruption indicates absence of any crystallization-gravita-tional differentiation in the volcanic duct. It was noted that in the clinopyroxenes there is a positive correlation between the content of aluminum-titanium and iron-manganese and a negative correlation between calcium-magnesium and aluminum-magnesium. Figures 12; tables 8; references 37: 24 Russian, 13 Western.
[291-5303]

USE OF LUMINESCENT CHARACTERISTICS OF CARBONATES IN SEARCH FOR CARBONATITES

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[Abstract] A study was made of the roentgenoluminescence spectra and
thermoluminescence curves of carbonates in order to clarify the typomorphic
criteria which can be used in the classification of rocks containing car-
bonates in the Sea of Azov region. Rock-forming carbonates (calcite, dolomite
and mixtures of calcite and dolomite) from rare-metal carbonatites were
studied, as well as fluorite-carbonate veins and nonore marbles and calciphyres.
It was found that carbonatites and the calciphyres which closely resemble
them can be distinguished using such luminescence criteria as the type of
curve and intensity of thermoluminescence of carbonates and the parameters of
the roentgenoluminescence spectrum of carbonates and apatite (distribution of
the Mn^{2+}, Ce^{3+}, Eu^{2+}, Dy^{3+} emission bands). Carbonatites are characterized
by two types of curves of thermoluminescence of carbonatites with a ratio of
intensities of thermoluminescence peaks $I_{T_3}/I_{T_2} \geqslant 1$, whereas calciphyres always

have the same type of curve with $I_{T_3}/I_{T_2} \geqslant 1$. Carbonatites have a very low

intensity of thermoluminescence of carbonates and complex roentgenoluminescence
spectra of carbonates and apatite caused by the superimposition of emissions
of rare earth elements on the Mn^{2+} emission. Calciphyres have a higher
intensity of thermoluminescence of carbonates and a simple spectral composi-
tion of emission of carbonates and apatite. A distinguishing characteristic
of calciphyres is also a stability of the shape of the curve and intensity
of thermoluminescence of carbonates, this reflecting the constant conditions
for their formation. The fluorite-carbonate veins with respect to the
luminescent properties of carbonates are close to the late generations of
carbonatites containing rare earth mineralization. Figures 5; tables 1;
references 16: 15 Russian, 1 Western.
[302-5303]

ISOTOPE ZONALITY OF KURIL ISLAND ARC BASED ON RESULTS OF STUDIES OF
$^{143}Nd/^{144}Nd$ and $^{87}Sr/^{86}Sr$ RATIOS

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[Abstract] A study was made of the isotope composition of neodymium and
strontium in the lavas of volcanoes on the frontal and rear zones of the
Kuril Island arc over practically its entire length. The rocks studied
included subalkaline olivine basalts and reflected the overall composition
of products of Quaternary volcanism in the area. Neodymium and strontium
were analyzed on a mass spectrometer. The frontal and rear zones of the
island arc are clearly differentiated based on isotope characteristics of
neodymium and strontium, with a decrease in $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ upon
transition from the frontal to the rear zone. The contribution of crustal
material to the formation of the isotope composition of neodymium and strontium
in Quaternary volcanites is negligible, meaning that the measured values of
isotope ratios are quite close the the values in the upper mantle beneath
the island arc. Figures 2; tables 1; references 11: 7 Russian, 4 Western.
[232-6508]

INTERRELATIONSHIP OF PHYSICAL PARAMETERS OF INTRUSIVE ROCK IN DEEP ZONES
OF CRUST IN NORTHWEST KOLA PENINSULA

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USSR Academy of Sciences, Apatity

[Abstract] Results are presented from processing of the density-magnetic
susceptibility correlation fields of ultrabasic intrusive rock in the
Lotinskiy block adjacent to the Pechenga and Allarechenskiy regions.
Mathematical-statistical methods are used to describe the stochastic
relationships between density and magnetic susceptibility of these
ultrabasites (peridotite and pyroxenite series) and gabbroids. The
relationships are applicable to the entire northwest Kola Peninsula.
Changes in regression equations are claculated for various depths by
modeling the magnetic parameters of the titanomagnetite contained in the
deep crustal rocks. A regression equation is also derived for the

relationship between density and elastic wave propagation velocity and a correction is introduced for the effects of high pressure. The regression equations are compared with those obtained for similar rocks of other regions, such as the central Kola Peninsula, the Ukrainian shield and the Middle Urals. Tables 2; references: 6 Russian.
[189-6508]

SCALE-OVERTHRUST STRUCTURE OF NORTHERN PART OF EAST KAMCHATKA ANTICLINORIUM

SHAPIRO, M. N., SLYADNEV, B. I. and LANDER, A. V., Earth Physics Institute imeni O. Yu. Shmidt, USSR Academy of Sciences; "Kamchatgeologiya" Geological Production Association

[Abstract] This article, based on materials obtained on Kumroch Range and to a lesser extent on Karaginskiy Island, gives a description of the structure of the northern part of the East Kamchatka Anticlinorium and discusses problems related to the kinematics and dynamics of its formation. The upthrusts and folds were formed in the Early Paleogene over a sub-horizontal fracture zone probably resulting from movement of basement blocks to the northwest. The structural basis of the East Kamchatka Anti-clinorium is steep scaled overthrusts. Most of the scales consist of com-pressed folds, frequently tilted to the east. Oligocene and Miocene move-ments were less intensive than in the early Paleogene, reaching their maximum amplitude in the neighboring synclinorium to the southeast. Figures 4; references 17: 14 Russian, 3 Western.
[186-6508]

STRUCTURE OF HEEZEN FRACTURE IN SOUTHEAST PACIFIC (BASED ON REFLECTED WAVES METHOD-DEEP SEISMIC SOUNDING)

KOGAN, L. I., GOL'MSHTOK, A. Ya., ZONENSHAYN, L. P. and SOROKHTIN, O. G., Southern Division, Oceanology Institute, USSR Academy of Sciences, Gelendzhik; Oceanology Institute, USSR Academy of Sciences, Moscow

[Abstract] Processing and interpretation of reflected waves method-deep seismic sounding data obtained during the 24th cruise of the research vessel

"Akademik Kurchatov" in 1977 in the Southeast Pacific (54°30'-55°45'S, 124°30'-127°00'W) revealed the structure and microstructure of the oceanic crust along the Heezen fracture and established that local components of compression here are decisive in the formation of the bottom relief and structural forms of the major crustal layers. The seismologic cross-sections indicate that the structure of the crust near the Heezen fracture is typical for the ocean floor. The petrographic structure is described in general terms. The studies indicate compressive structures. The Pacific lithosphere plate with its thicker crust (up to 10 km) overthrusts the Antarctic plate with a thinner crust (7 km). As a result, a depression with an amplitude of 1.5-2 km has arisen along the compressive axis and on the southern limb there is an underwater ridge over 5 km high. Thin amphibolic shales have been formed under the compressive conditions in a narrow zone of the transformed Heezen fracture due to dynamometamorphism. The compression conditions probably arose due to incomplete matching of the orientation of the fracture with the direction of movement of the Pacific and Antarctic plates in this region. Figures 3; references 12: 10 Russian, 2 Western. [190-6508]

NEW DATA ON CARBONIFEROUS STRATIGRAPHY OF EASTERN MARGIN OF CASPIAN DEPRESSION

AKHMETSHINA, L. Z., BULEKBAYEV, Z. Ye., VAKULA, L. I., KALMYKOVA, A. G., KUKHTINOV, D. A., MARCHENKO, O. N., SANINA, L. V. and YUL'METOV, Sh. F., Kazakh Scientific Research and Geological Prospecting Institute, Aktyubinsk

[Abstract] In the past few years, Carboniferous strata have been found in boreholes in many areas in the eastern Caspian depression. Deposits of varying stratigraphy have been found immediately beneath the Dokungur Lower Permian. Three structural zones have been foudn, the Kenkiyakskaya, Tortkol'skaya and Zhanazhol'skaya zones. The stratigraphy of each of these three zones is described in detail. A diagram illustrates the sequence and thickness of the deposits in each of these three zones. Figures 2; references: 10 Russian.
[190-6508]

UDC: 550.822.6/.7(268.45+268.52)

PARAMETRIC WELLS ON ISLANDS IN BARENTS AND KARA SEAS

GRAMBERG, I. S., SHKOLA, I. V., BRO, Ye. G., "Sevmorgeologiya" Geological Production Association, and SHEKHODANOV, V. A. and ARMISHEV, A. M., "Volgokamskgeologiya" Geological Production Association

[Abstract] Geological prospecting work including drilling of parametric boreholes is in progress on the shelf of the Arctic Ocean. The major task of the drilling is to determine the age, material composition and physical properties of rocks making up large geostructural elements of the island masses and adjacent shelf. Five boreholes have been drilled to date. Each of these wells is briefly described. As a result of processing of materials from the wells, information has been obtained for the first time on the structure of the sedimentary cover and folded basement, as well as magmatism in the shelf edge upthrust zone of the Barents Sea. It has been established that between the Early Carboniferous and Early Cretaceous this zone developed as a young platform. The sedimentary cover of the platform is homogeneous in terms of type of sediment, facies makeup, periods of tectonic activity and manifestations of trapped magmatism. One peculiarity of the zone is the small thickness of deposits in the early stages of katagenesis. The terrigenous rock at shallow depths therefore has high density and high elastic wave propagation velocity. The cross-section of Mesozoic deposits in the southeastern part of the Kara Sea shelf is similar to cross-sections of rocks of the same age in northwestern Sibera, differing in having generally greater sandiness. The metamorphic rock penetrated by the wells is comparable to the Lower Proterozoic formations of western Taymyr. Figures 1.
[253-6508]

UDC: 550.348.433

SPECTRAL PRECURSORS OF PETROPAVLOVSK EARTHQUAKE OF 24 NOVEMBER 1971

ZOBIN, V. M. and CHIRKOVA, V. N., Volcanology Institute, Far Eastern Scientific Center, USSR Academy of Sciences

[Abstract] This article continues a series of studies devoted to the search for spectral precursors of strong earthquakes and eruptions on Kamchatka. The article describes variations in spectral characteristics of P waves of weak earthquakes in the vicinity of the focus of the Petropavlovsk earthquake of 24 November 1971, one of four very strong earthquakes in Kamchatka over the past twenty-five years. Anomalies in the spectral composition

of P waves were observed with a 99% confidence level for four years before the main shock. The contradictory nature of detected spectral precursors of strong earthquakes is attributed to the specifics of the physical structure of the medium in which the strong earthquake is prepared. At the present stage of research of spectral precursors there is no model capable of explaining the anomalous nature of changes in mean values of fault stresses at the foci of weak earthquakes in the area where a strong shock is being prepared. However, since in practically every case investigated a significant anomaly is observed in the behavior of the spectral precursor, the authors are convinced of the necessity of continuing research in this direction. It is hoped that additional data will yield a model of the spectral precursors of strong earthquakes. Figures 6; tables 3; references 16: 10 Russian, 6 Western.
[225-6508]

VERTICAL MOVEMENTS OF CRUST IN KURIL ISLANDS IN RELATION TO EARTHQUAKE

NIKONOV, A. A. and YAKUSHKO, G. G., Earth Physics imeni O. Yu. Shmidt, USSR Academy of Sciences; Sakhalin Complex Scientific Research Institute

[Abstract] Geological-geomorphological studies in the coastal zone and sea level observations are particularly important in the study of contemporary vertical movements of the Kuril Islands crust due to the limited capabilities of the repeated high-precision leveling method. Two groups of observations made at the same points were used for mutual testing and determining possible nonuniformity of movement during various time intervals. An attempt was made to determine the long-term trend of movement at each point studied and where possible to determine temporary disturbances, which were then compared with the occurrence of strong earthquakes. Most of the points examined on the Kuril Islands appear to have undergone upthrusting over the past thousand years at 0.25-2.0 mm/yr. Subsidence was observed along the east coast of Shikotan Island. Varying degrees of correlation of movement over the past decade were observed at different points. In some cases these recent movements were found to agree with, in other cases to be in the opposite direction from, the long-term movements. This may be attributable to appearance of rapid oscillating movements related to strong earthquakes. Figures 2; tables 1; references 12: 8 Russian, 4 Western.
[225-6508]

HARDWARE AND SOFTWARE SUPPORT OF GEOLOGICAL-GEOPHYSICAL DATABASE

IVANOV, V. A., IVANCHENKO, G. A., KARLSON, N. N. and YAKOVENKO, N. S.,
Novosibirsk

[Abstract] The greatest difficulty in processing of geological and
geophysical data on computers is that of representing the data on punch
cards. This report describes the first version of a geological-geophysical
database and the software which allows input and output, storage, editing
and analysis of the data jointly with pictures. Coded graphic information
is transferred from cards to magnetic tape and output is through a plotter.
The objects in the database are various points on coded maps. An object
has three attributes: a characteristic (reference point, isoline, profile,
linearment, etc.), value of geological-geophysical quantity (e.g.,
temperature in borehole) and coordinate of the point coded. The database
is physically kept on 7.5-Mb magnetic disks using FMS-10 and FMS-D file
management systems under DOS-10 on a YeS-1010 minicomputer. The first
part of the geological-geophysical database allows coding, storage and
editing of geological-geophysical maps, reduction of the maps to a common
topographic base, as well as geometric transformation of photographic images
to the same topographic base, allowing work to be started on combined analysis
of data and photographs. References: 6 Russian.
[262-6508]

USE OF SEISMOSTRATIGRAPHY IN OIL AND GAS PROSPECTING STUDIES ON NORTHERN
SAKHALIN

KONONOV, V. E., LOPATNEV, Yu. V., SLUDNEV, Yu. G. and KHARAKHINOV, V. V.,
Sakhalinmorneftegazprom All-Union Production Association Okha-na-Sakhaline

[Abstract] Northern Sakhalin is one of the oldest oil- and gas-producing
regions in the country, but contains a great deal more oil and gas.
Geological and geophysical materials of recent years indicate significant
differences in the structural plan of various Neogene masses in northern
Sakhalin. These peculiarities of structure have created unique types of
hydrocarbon traps, buried horst upthrusts of clay and sand deposits. Search
for these traps is now underway by the reflected waves seismic prospecting
method. Geological-geophysical studies at present are directed toward
detailed analysis of the structural plan of the Middle Miocene-Pliocene

deposits. Seismostratigraphic studies have revealed that the base of the
mass of deposits containing hydrocarbon traps consists of a combination of
horsts and grabens in the western edge of the northern Sakhalin depression.
Local traps form extended zones, consisting of a combination of a graben
with hemianticlinal and monoclinal upthrusts. The depths of the deposits
vary between 2,000 and 4,200 m. The objective of the studies is to establish
a relationship between wave field characteristics and lithology of the Neogene
cross section and to locate characteristic seismic facies which are
potentially oil and gas bearing. The stratigraphic evidence indicates the
presence of one such complex area. A figures illustrates its spatial
parameters. Figures 4; references: 9 Russian.
[168-6508]

BOUNDARIES OF EASTERN SIKHOTE-ALIN VOLCANIC BELT BASED ON STATISTICAL
MAGNETIC FIELD ANALYSIS

KORTUNOV, V. A., KULINICH, R. G., MOSKVICHEV, V. S. and PLATUNOV, V. I.,
Far Eastern Polytechnic Institute, Vladivostok

[Abstract] An attempt was made to utilize magnetometry in the solution of
some problems of geocartography, based on statistical analysis of the
anomalous magnetic field. Results were analyzed from aeromagnetic surveying
within the continental portaion of Primor'ye, plus a hydromagnetic survey of
the shelf zone of the Sea of Japan. Primary attention was given to spectral
and autocorrelation analysis of the anomalous magnetic field. The properties
of the field were determined to be a random function in these areas. Some
specifics of the geological structure of the territory can be learned from
the major features of the structures of the field. The distribution of
spectral and autocorrelation parameters of the field is stable or identical
for areas of the crust with similar geological structure. Some reduction is
observed in energy density of the magnetic field along the hydromagnetic
measurement lines, probably as a result of increasing distance of the
anomalous sources due to the intervening mass of water and, possibly, sedi-
mentary deposits. Figures 5; references: 2 Russian.
[168-6508]

DEEP STRUCTURE OF PENZHINO-ANADYR FOLDED ZONE AND EVENSK VOLCANIC ZONE BASED ON GRAVIMETRIC DATA

FILIMONOV, B. N., POPOVA, O. D., RED'KINA, G. A. and ROMANOVA, Ye. K., Sevvostgeologiya Geological Production Association, Central Geophysical Expedition, Khasyn, Magadan Oblast

[Abstract] Results are presented from geological interpretation of gravimetric data from the Penzhino-Anadyr folded zone of the Okhotsk Late Mesozoic folded area and the Evensk volcanic zone in the Chukotsk volcanic belt. The deep structure of the areas is analyzed on the basis of geological interpretation of geophysical data. The major elements of the anomalous gravitational field in the area are three bands of positive residual gravitational anomalies with areas of 500-3,000 km^2. The two zones studied are parts of a large tectonic structure, the Albian-Cenomanian island arc extending 2,000 km from Okhotsk to the upper regions of the Belaya River, a tributary of the Anadyr. The center of the Okhotsk-Chukotsk volcanic belt is related to this island arc system. The direction of tectonic movements and distribution of magmatic formations are determined by regularities of the evolution of the ancient island arc in this area. Figures 3; references: 5 Russian.
[168-6508]

PHYSICS OF ATMOSPHERE

HIGH-ELEVATION STATION'S COSMIC-RAY RECORDING SYSTEM

Moscow IZVESTIYA in Russian 5 Apr 85 p 3

[Text] Scientists of the high-elevation cosmic-ray station of the Kazakh
Academy of Sciences' Institute of High-Energy Physics have begun their
first experiments for recording cosmic particles with a new automated
system, the "Adron-44".

The "Adron-44" is a unique complex which was developed by physicists of
Kazakhstan. It is located at the Tien-Shan High-Elevation Station in the
Zailiyskiy Ala-Tau Mountains, at an elevation of 3,400 meters above sea level.

Experiments at the cosmic-ray station will make it possible to obtain new
information on processes of the interaction of cosmic-radiation particles
with matter.

(A photograph was given showing science associates A. Baygubekov and K. Amanov
taking readings from an instrument in the field.)

FTD/SNAP
CSO: 1865/278

VIDEO TERMINAL FOR ANALYZING AERIAL INFRARED PHOTOGRAPHS

Moscow NTR: PROBLEMY I RESHENIYA in Russian 5-18 Mar 85 p 2

[Excerpt] A "Self-Contained Video Information Terminal" SVIT) has been
developed at the USSR Academy of Sciences' Institute of Space Research (IKI)
in collaboration with the Kirov Polytechnical Institute.

Equipment and methods which have been developed at IKI for digital processing
of images are finding employment in various fields of science and the economy,
particularly in the solution of problems of mapping temperature patterns of
the Earth's surface and atmosphere.

[A photograph was given showing] a fragment of an infrared 'portrait' of a
city that was produced on the screen of the SVIT. Clearly distinguishable
atainst a dark background in this picture are spots of light with different
degrees of brightness: a power-and-heating plant with five cooling towers,
a heat-transport line running from this plant, and a waste-water discharge
channel. Moreover, it can be seen that one of the cooling towers, (the
middle one), is not operating. Also "shining" brightly is a large residential
building-complex, next to which faint spots of light indicating the location
of a separate building are slightly visible.

The SVIT is capable of subdividing an image into 256 digital gradations.

Currently under development are methods for analyzing infrared video informa-
tion which the Central Experimental and Methodological Geological-Geophysical
Expedition has been obtaining in the course of aerial photographing in line
with a program for ecological monitoring of cities.

FTD/SNAP
CSO: 1865/328

UDC: 551.510.42:551.521.3

COMPARISON OF SINGLE-PARAMETER STATISTICAL MODEL WITH RESULTS OF ROUND-THE-CLOCK MEASUREMENT OF LIGHT-SCATTERING MATRICES

SVIRIDENKOV, M. A., GORCHAKOV, G. I., ISAKOV, A. A. and SIDOROV, V. N., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] A statistical model proposed in a previous study is shown to agree with the results of round-the-clock measurements of light scattering over a range of 2 to 50 km. Exceptions include extreme situations such as dust storms. The single-parameter model results from uniform matched transformations of angular variations in scattering matrix components with changes in the visibility range due to two main factors, condensation transformation of the distribution of particles by size and changes in the refractive index, including heterogeneous condensation of volatile vapors, plus changes in the relative contribution of moleculear scattering. The statistical model can be corrected for individual data sets by considering the mean particle concentration. At long ranges the model becomes inadequate to the observed variability in light scattering characteristics due to non-condensational processes of transformation of aerosol and the dry aerosol base, leading to significant variations in concentration. Figures 5; tables 1; references: 10 Russian.
[256-6508]

IONIC MECHANISM OF EXCHANGE OF ADMIXTURES BETWEEN HYDROSPHERE AND
ATMOSPHERE

SAVCHENKO, A. V. and SMIRNOV, V. V., Experimental Meterology Institute

[Abstract] Experiments conducted by the authors are used as the basis for
a proposed quantitative model of evaporation which takes into account the
microphysical and macrophysical characteristics of an ionogenic solution and
the surrounding gas medium. Certain practical applications to real
atmospheric processes are discussed. The experiments are based on observa-
tions of alteration of the charge exchange spectrum of an evaporated liquid-
drop aerosol and changes in polar conductivities of the surrounding air.
The possible contribution of the mechanism to transfer of ions in the atmo-
sphere immediately above the ocean, in fog and clouds is studied. Figures 3;
references 32: 21 Russian, 11 Western.
[256-6508]

INFLUENCE OF SCATTERING MEDIUM OPTICAL IMAGE QUALITY

VOLNISTOVA, L. P. and DROFA, A. S., Experimental Meterology Institute

[Abstract] In order to study the influence of the position of a scattering
medium on the transfer of an optical image, the authors measured the
characteristics determining the quality of visibility of objects at various
distances between the scattering layer along the path and the object being
observed. Results of the experimental study are presented and factors
leading to contradictory results in different works are analyzed. The
nonmonotonic variation in frequency-contrast characteristics of a thin
scattering layer as a function of the position of the layer on a path
observed in previous studies results from limitation of the interval of
observation angles of the test image. Improvement in the quality of
visibility through a scattering layer as the layer is moved toward the
opposite end of the sighting path observed in an earlier study can be
attributed to changes in the criterion used to evaluate image quality.
Figures 5; references: 19 Russian.
[256-6508]

DAMPING OF HIGH-FREQUENCY WIND WAVES BY ARTIFICIAL SURFACE-ACTIVE FILMS

YERMAKOV, S. A., PANCHENKO, A. R. and TALIPOVA, T. G., Applied Physics
Institute, USSR Academy of Sciences

[Abstract] Field experiments with artificial slicks made of surface-active
agents have shown that in areas covered by such films the intensity of wind
waves decreases greatly over a broad frequency range. This article studies
the damping of high-frequency wind waves in small artificial slicks on the
order of ten meters in diameter. Experiments were performed in October 1982
along the Black Sea coast from an oceanographic platform with winds of up to
about 6 m/s. A resistance-type string wave recorder was used to measure
wave heights. The high-frequency (over 2-3 Hz) component of wind waves was
sharply reduced by the artificial surface-active slick. With very weak
winds, the contrast in the high-frequency portion of the spectrum is well
described by a theoretical curve in which the major factor involved is the
effect of direct dissipation of surface waves resulting from the presence
of the elastic surface-active film. As wind speed increases to about 6 m/s
the mean contrast in the gravity-capillary range of frequencies monotonically
approaches 1, that is the damping effect of the film decreases. Figures 5:
references 12: 7 Russian, 5 Western.
[256-6508]

ORGANIC COMPONENTS IN ATMOSPHERE IN REGIONS OF VOLCANIC ACTIVITY

ISIDOROV, V. A. and ZENKEVICH, I. G., Leningrad State University
imeni A. A. Zhdanov

[Abstract] Model experiments and thermodynamic calculations indicate the
possibility of formation of a broad range of volatile organic components in
volcanic processes. In September and October 1983 the authors sampled the
air in the region of active volcanoes on Kunashir Island, performing mass
spectrometric and gas chromatographic analysis. Fifty-eight organic com-
pounds detected in the air samples are listed. Benzene was present in the
greatest quantity. The analyses agreed with model experiments involving
abiogenic synthesis of organic compounds under conditions simulating volcanic
activity and indicate the presence of natural sources of fluorochlorohydro-
carbons which must be considered in estimating the influence of halogen-
containing organic compounds on the status of the earth's ozone layer.
Tables 2; references 15: 5 Russian, 10 Western.
[229-6508]

EVALUATING INFLUENCE OF WAVES ON DYNAMIC STRUCTURE OF ATMOSPHERIC NEAR-WATER LAYER

YEGOROV, K. L., Leningrad Hydrometeorological Institute

[Abstract] At present there are no convincing experimental data making it possible to draw conclusions on the quantitative influence of waves on meteorological parameters. Many different studies have given contradictory data and conclusions on this subject. Due to this ambiguity the author has sought a possible clarification by an analysis of the possible qualitative influence of the wave-covered ocean surface on the vertical profile of the characteristics of turbulence at the interface on the basis of known hypotheses of the semiempirical theory of turbulence. Specifically, on the basis of solution of the equation for the balance of turbulent energy a study is made of the stationary turbulence regime in a flow with a velocity shear near the wave-covered surface, taking into account the diffusion of the kinetic energy of turbulence from the wave layer in the case of a neutral stratification. The solution is analyzed using a generalized Karman model for the mixing path. This gives evidence of the possibility of existence of conditions characterized by a decrease in the turbulence coefficient with increasing distance from the surface (this is in agreement with some published data). Finally, the computed wind velocity field is compared with observational data. It is shown that the peculiarities observed in structure of the atmospheric near-water layer can be qualitatively correctly taken into account by setting boundary conditions different from conditions over the land and assuming an exchange of turbulent energy between the wave layer and the air flow. Figures 2; references 16: 12 Russian, 4 Western.
[235-5303]

GLOBAL MODELING OF OPTICAL CHARACTERISTICS OF ATMOSPHERIC AEROSOL

KONDRAT'YEV, K. Ya., academician, MOSKALENKO, N. I., SKVORTSOVA, S. Ya., ZAKIROVA, A. R., YAKUPOVA, F. S. and GUSEV, S. V.

[Abstract] A system for the global modeling of the optical characteristics (OC) of atmospheric aerosol (AA) is proposed. The global structural model of AA is based on a map of the earth's natural landscapes, the temperature

field of the underlying surface or the temperature of the surface air layer and the zonal and meridional components of wind velocity. At the basis of the model are the background aerosol, "floating" in altitude and latitude, and disturbed layers of the zone of active turbulent heat exchange (ZATHE), "banded" transport of the dust aerosol of the middle troposphere and volcanic stratospheric aerosol. The following are defined in the vertical structue of AA: boundary zone of surface atmospheric haze with a thickness of 0-70 km in which there are considerable dirunal variations in the density of AA and the volumetric concentration of particles usually decreases with altitude; a layer of active turbulent exchange with an AA concentration which is constant in altitude and whose upper boundary z_2 varies in a wide range (the lower limit of z_2 values is limited by the height of the surface boundary zone z_1); the middle troposphere layer $z2 - z_3$ with a sharp drop in aerosol concentration to the background level; the layer of upper troposphere background aerosol ($z_3 - z_4$), the layer of stratospheric (volcanic) aerosol ($z_4 - z_5$) (the maximum of particle concentration in which corresponds to altitudes 22-26 km in the equatorial region and 17-18 km in the polar regions). The model is analyzed. For example, the ZATHE z_2 altitude is dependent on the energy of turbulent heat exchange over the underlying surface or the heat influx to the underlying surface – troposphere system;; the z_2 altitude is determined by the type of underlying surface and the mean daily air temperature at the underlying surface. Roughly speaking, the global monitoring of OC of AA is possible on the assumption that the optical density of AA over the land in the ZATHE zone is constant. Over the sea surface allowance must be made for the effect of wind velocity on the vertical profile of optical density in the ZATHE. Optical models of AA can be based on a data bank of OC for different AA fractions with different microstructure and chemical composition. The modeling of OC of AA revealed that the greatest optical thickness of AA is observed at the hottest time of the year and in the warmest zones when the ZATHE altitude attains 4 km and the optical thickness of AA is $\approx 0.3-0.4$. The most transparent atmosphere is in the cold season (polar regions) when ZATHE altitude is minimum and the optical thickness decreases to 0.01-0.03. The density of background aerosol also correlates with ZATHE temperature. Figures 3; references: 3 Russian. [266-5303]

DIURNAL VARIATION OF OPTICAL AND MICROPHYSICAL CHARACTERISTICS OF NEAR-SURFACE AEROSOL

SIDOROV, V. N., GORCHAKOV, G. I., YEMILENKO, A. S. and SVIRIDENKOV, M. A., Atmospheric Physics Institute, USSR Academy of Sciences

[Abstract] The article gives data on the mean diurnal variation of the coefficient of light scattering σ, the scattering coefficient σ_{dry} for the dry base of aerosol and microstructural parameters obtained by the inversion of optical information. The study was based on data from around-the-clock measurements of the four components of the light scattering matrix D_{11}, D_{21}, D_{33} and D_{43} for five fixed scattering angles in the range 15-165° (wavelength of light $\lambda = 0.55$ μm). It was found that the principal features of the diurnal variation of the parameters of optically active aerosol are determined by its condensational transformation with a change in relative humidity and by local processes of accumulation and elimination of aerosol, whose relative role and effectiveness change over the course of a 24-hour period. The accumulation of the mass of dry aerosol matter under nighttime conditions is associated primarily with the growth of particles, but during the daytime a significant role is played by processes resulting in an increase in the concentration of the submicron aerosol. The cyclicity in the change in total content of optically active aerosol in the surface layer, in combination with a clearly expressed dependence of its parameters on relative humidity and the effectiveness of vertical mixing, are indicative of a possibility for predicting the state of aerosol within the framework of a local synoptic forecast. Figures 3; tables 1; references 17: 15 Russian, 2 Western. [235-5303]

NEW TEAM FOR SP-27 ARCTIC DRIFTING STATION

Leningrad LENINGRADSKAYA PRAVDA in Russian 18 Apr 85 p 4

[Article by N. Osipov]

[Text] A group of polar explorers of a new replacement contingent for the
drifting station "Severnyy Polyus-27" (SP-27) took off from Leningrad for
the Arctic yesterday. The group is headed by V. S. Rachkov, science
associate of the Arctic and Antarctic Institute and an Experience polar
researcher.

The new expedition will devote much attention to questions of conserving
the biological resources of areas of the Far North and safeguarding human
health.

The ice floe on which "SP-27" will drift is now located approximately
500 kilometers to the north of the New Siberian Islands.

FTD/SNAP
CSO: 1865/328   - END -